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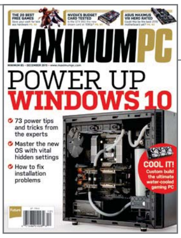
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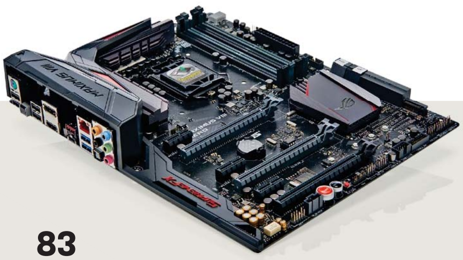

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Tuan
Nguyen

PREDICTIONS AND PREMONITIONS

THERE'S A SAYING that goes something like: If you're using a PC, then you're always lusting after the gear in our pages. Actually, I just made that up, but think about it quite a bit.

We're pretty fortunate to be able to play with the latest and greatest tech toys. Companies reach out to us all the time with pleas to have us get intimate with their products. However, we're never at a standstill. Even as we write the conclusion to one review, there's something new on the horizon.

If 2015 is any indication, more is definitely on the way. To me, 2015 in tech has been good, but it wasn't jaw-dropping—no revolutionary new technology emerged that caused my semi-voluntary muscles to quiver. I suspect, given all that's happened, 2015 wasn't meant to be a year for shock and awe, it was meant to be the calm before the storm. The shocker year is going to be 2016. The reason is simple: VR.

In 2016, VR will be ready for consumer consumption. Despite its initial high price tag, the fact that VR will be accessible by many will spur development the likes of which we haven't seen since the early days of 3D-accelerated graphics. New hardware with greater performance and more features, next-gen applications and games, new input accessories, and a host of other components will launch, all in the service of the next leap in computer user interface, and all in the service of an intangible user experience.

As tablets and phones approach an invisible ceiling due to their form factor and usage model, the hardware push in mobile will slow down. It won't completely stop, but there will be a substantial shift in focus.

I'm slightly averse to using the term VR, simply because it's been such a cliché all these years. But now it's real, and that's where the industry will shift to next. We've reached VR critical mass.

In case you haven't already surmised, I'm really excited about going into 2016. It's going to be the year in which we'll see substantial improvements across the board. I predict there to be new GPU technology centered around supporting features necessary to make a great VR experience, coupled with interactive content and media. The content side of things will probably be a bit rough at first, as developers figure out best practices and approaches. For a truly great experience, content needs to be developed with VR in mind from the get-go. Rehashing current content for VR isn't the way to go.

Just as the advent of multi-touch phones reinvented the mobile phone and what it could be, VR will do the same for the PC. I suppose one could call it the reboot of the PC. Reboot—I like the sound of that.

Tuan Nguyen is Maximum PC*'s editor-in-chief, also known as "the pointy end of the stick." He's been writing, marketing, and raising hell in the tech industry for 19 years.*

↘ submit your questions to: comments@maximumpc.com

THE NEWS

Getting Impatient with Adobe Flash

Is it finally time to move on to HTML5?

IT SEEMS AT TIMES that no sooner does Adobe plug a security hole in its Flash Player, than another one is discovered. Like trying to fix a persistently leaky ship, at some point you have to wonder if it's time to get a new vessel, and that's the point where the web is now.

The anti-Flash sentiment that exists today wasn't always there. Back when the Internet was in its mainstream infancy, developers used Flash to display animations, make games, and create an interactive experience with video, sound, and other dynamic elements. Flash played an important role in the web's evolution to what it is today, both good and bad.

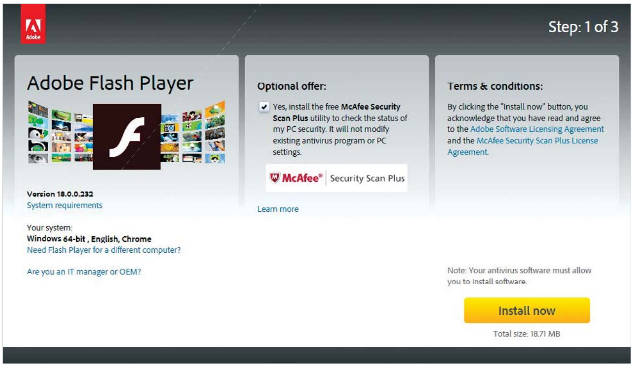
Unfortunately for Adobe, the bad might be outweighing the good at this point. In a recent threat report, Intel's McAfee Labs noted an alarming three-fold rise in Flash malware samples. The report came out around the same time that it was discovered that an Italian surveillance malware vendor called Hacking Team was itself hacked. Among the data that was taken (and published) were several zero-day vulnerabilities in Flash that were considered critical. As always, Adobe was quick to patch the security holes, but what Adobe can't seem to fix is the anti-Flash sentiment that's resonating across the web.

"Zero day security vulnerabilities in Flash occur with such regularity that many browsers have stopped supporting it or have made it very easy to disable," Tyler Cohen Wood, Cyber Security Advisor for Inspired eLearning, told Maximum PC. "So far, HMTL5 is proving to be a more secure solution."

Indeed, browser makers are taking matters into their own hands to protect their users. Google recently began pausing Flash ads by default and told developers they should convert their Flash-based ads to HTML5, while Mozilla decided to temporarily block Flash content by default in Firefox until Adobe could work out a fix for the aforementioned security holes.

Browsers aren't the only turning point for Flash. YouTube made the switch from Flash to HTML5 for its default video player, and Twitch has begun phasing out Flash for HTML5, too. Everywhere you look, the writing is on the wall.

> Web developers no longer need to rely on Flash to add interactive web experiences



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Adobe Flash (and the "plugin has crashed" warning) might not be long for this world if the web at large adopts HTML5.

Ken Westin, a senior security analyst for TripWire, told Maximum PC that "the days of Flash are numbered. With the advancement of HTML5, with more powerful and standardized JavaScript frameworks and more flexible video support, web developers no longer need to rely on Flash to add highly interactive web experiences."

So, why hasn't the web at large moved on from Flash already? That's easier said than done, considering Flash is so prevalent on the web. Nevertheless, Facebook's chief security officer, Alex Stamos, called for "Adobe to announce the end-of-life date for Flash" on Twitter, but so far it hasn't done that. Not everyone thinks it will.

We reached out to antivirus vendor Kaspersky Lab for some insight on the situation. The company's Principal Security Researcher, Kurt Baumgartner, told us "the death of Flash has been declared for years, and yet Flash continues to be everywhere. Flash is robust, cross-platform, has a large developer base, and is installed on a massive number of computing devices. While HTML5 video functionality is catching up and its development base growing, I don't see Flash disappearing immediately."

Nevertheless, Baumgartner didn't rule out Adobe issuing a kill-date for Flash, but for now, one doesn't exist. **–PL**

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IDC doesn't count 2-in-1s like Surface in its PC sales data.

IDC SOUR ON NEAR-TERM PC OUTLOOK

Waiting on Windows 10's impact before action

WHEN IT COMES TO the PC market, analysts tend to err on the side of gloom and doom. We wondered if that would still be the case once Windows 10 released to the public, and though it's now installed on more than 75 million devices, at least one market research firm is predicting an ongoing decline in PC sales.

International Data Corporation (IDC) is forecasting that worldwide PC shipments will slip in the neighborhood of 8.7 percent in 2015, and if true, that would make five consecutive years of declining growth.

Why the negative outlook? IDC points out that even though vendors have been preparing for Windows 10 systems in the second half of the year, the shrinkage is related to a "stubbornly large inventory of notebooks from prior quarters and severe constraints posed by the decline of major currencies relative to the U.S. dollar."

Even so, IDC predicts a combined 281.6 million portable and desktop PC shipments in 2015. In other words, the PC market is by no means dead or dying.

Looking ahead, IDC believes growth will resume in 2017, led by the commercial market, albeit not by leaps and bounds—the research firm forecasts 282.1 million shipments in 2019, up half a million from the end of this year.

It's worth noting that IDC doesn't include two-in-one devices with detachable keyboards in the portable PC category. That includes the Surface Pro, and makes IDC's data a bit murky, especially since it notes that detachable devices are "starting to gain traction."

"While the two-in-one form factor is not new, OEMs are getting more serious about this market and as a result IDC expects the two-in-one segment to grow 86.5 percent year over year in 2015 with 14.7 million units shipped," IDC said. **–PL**

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EASY AS BUILDING LEGOS

ONE OF THE MORE INTERESTING PRODUCTS Acer announced at IFA 2015 in Berlin is the Revo Build, a unique system that allows customers to stack components like building blocks instead of cramming them into a single chassis. These blocks communicate with each other using pogo pins that have a magnetic component. That means customers won't have to fiddle with wires when switching out components.

The Revo Build consists of a base block that plays host to the motherboard, an Intel Pentium or Skylake Celeron processor, integrated Intel HD graphics, and memory configurations of up to 8GB of DDR4 RAM. The company says the memory can be upgraded by simply "loosening" one screw. Acer also claims the blocks can work independently or with other PCs.

There will be 500GB and 1TB hot-swappable HDD blocks at launch, plus a wireless power bank block and an audio block with speakers. **–KP**

AMD CREATES RADEON TECHNOLOGIES GROUP

A rededication to graphics

NEARLY A DECADE after acquiring ATI, AMD has spun off its graphics division into a separate business called Radeon Technologies Group.

AMD's Dr. Lisa Su said the move is aimed at solidifying the company's position as a graphics industry leader while recapturing graphics market share from the competition. The dedicated unit will also focus on new and emerging markets for graphics, including virtual reality and augmented reality.

Heading up this new division is Raja Koduri, a veteran in the industry and even a bit of a legend in the graphics department. His roots date back to the days of S3 and later ATI. After AMD acquired ATI in 2006, Koduri served as CTO of graphics until leaving for Apple in 2009, where he helped popularize the "Retina" term. He then returned to AMD in 2013 and was instrumental in developing AMD's Fury line with High Bandwidth Memory (HBM). **–PL**

Tech Tragedies and Triumphs

A monthly snapshot of what's up and down in tech

TRIUMPHS	TRAGEDIES
WELCOME BACK, DIAMONDACK! Peripheral maker Razer announced the return of its Diamondback mouse, first released in 2004, albeit updated with a better sensor and LED lighting.	**FORCE FEEDING WINDOWS 10** Microsoft ticked off some Windows 7 and 8/8.1 users by automatically pushing out Windows 10 upgrade files through Windows Update.
CHROME GOES ON A DIET With Chrome 45, Google has improved its browser's memory usage, making it less of a RAM hog.	**BETTER CALL SAUL** Parents sued a school for $250,000, alleging that its Wi-Fi was making their son ill.
MINGLING IN MINECRAFT Microsoft updated the Windows 10 Edition Beta of Minecraft to support multiplayer with Windows Phone, iOS, or Android mobile devices.	**NICE TRY, APPLE** Apple's 12.9-inch iPad Pro is drawing comparison to Microsoft's Surface, but it lacks standard ports and runs a mobile OS.

Tom Halfhill

FAST FORWARD

XPoint Upsets the Memory Hierarchy

READER SURVEYS INDICATE that most Maximum PC readers are using SSDs as boot drives. You're apparently still using large hard drives for mass storage, however, creating a hybrid system that blends maximum speed with affordable capacity.

Now, imagine adding another new memory technology that will further boost your computer's performance to a similar degree. Interested? You bet. And that's what Intel and Micron are promising with XPoint memory, which is a cross between DRAM and flash memory.

I've avoided writing about XPoint until now because I wanted more technical details. Intel and Micron still haven't disclosed enough information to judge it fairly. From what we know, however, it's likely to significantly boost system performance and shake up the industry, just as SSDs have. Like many new technologies, XPoint will appear first in servers before trickling down to PCs.

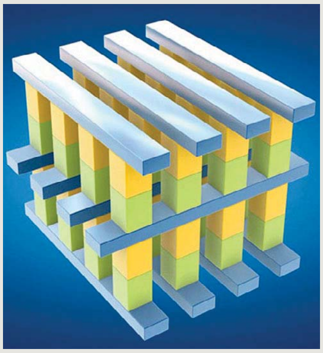
XPoint probably won't replace any existing memory technology. Instead, it will find a new place in the memory hierarchy. In descending order of speed and cost and ascending order of capacity, that hierarchy now includes SRAM, DRAM, flash, hard disk drives, and tape. (Yes, servers still use tape drives for archival backups.)

XPoint is a nonvolatile solid-state technology that fits between DRAM and flash memory. It's nearly as fast as DRAM, but retains its state when powered down, like flash. But it's about 1,000 times faster than flash and has much better endurance (read/write life). Although it will probably cost more than flash, it will cost less than DRAM. Together, these qualities prevent XPoint memory from replacing DRAM or flash unless future refinements make it faster than the former or cheaper than the latter—and those memory technologies keep improving, too.

> I'm guessing that XPoint is resistive RAM (RRAM), a non-transistor technology that's been kicking around the labs for 10 years or so

Intel plans to initially deploy XPoint memory in SSDs for servers. Next it will come in DIMMs that plug into server DRAM slots. The idea is to put this fast, nonvolatile memory close to the processor, where it will supplement the slightly faster DRAM while buffering the much slower (!) flash-based SSDs. Behind the flash SSDs will be the usual HDDs and tape drives. This new hierarchy will enable servers to hold large databases and other enterprise applications entirely in DRAM and XPoint memory, thus avoiding the relatively slow access to the storage drives.

Production volumes will be low at first, keeping prices beyond the reach of most PC users, but within reason for enterprises that can justify the high cost by pumping up performance. Though Intel and Micron say future refinements will cut costs, here's where things get fuzzy. Neither company is disclosing enough technical detail to estimate the cost curve or analyze other factors, such as power consumption.



Xpoint's resistive material is stacked in a 3D lattice.

Even the basic technology is a secret. Unlike SRAM, DRAM, and flash, XPoint doesn't use transistors. In fact, the technical illustrations resemble core memory, a 1960s technology that stored binary bits in tiny magnetic doughnuts woven into a wire fabric. I'm guessing that XPoint is resistive RAM (RRAM), a similar nontransistor technology that's been kicking around the labs for 10 years or so. Whatever it is, XPoint looks like the biggest thing to happen to computers since SSDs. It's coming to servers in 2016 and probably to a future Dream Machine—wherever cost is no object.

Tom Halfhill was formerly a senior editor for *Byte* magazine and is now an analyst for *Microprocessor Report*.

CyberPower recommends Windows.

Windows 10

AMD

AMD RADEON GRAPHICS

AMD FX UNLOCKED

AMD A SERIES

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Zalman Gaming Headset
NZXT Source 340 Orange
Asetek Liquid Cooling System

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CORSAIR® 16GB DDR3 1600Mhz Dual Channel Memory
2TB SATA III HDD 7200RPM 64MB Cache
AMD Radeon™ R9 380 4GB Direct X 12 Video
Zalman Gaming Headset
Thermaltake Core V31Gaming 600Watt 80+ Power
Asetek Liquid Cooling System

14X Combo · AMD 7.1 600 W · CoolerMaster® Keyboard · CoolerMaster® Optical Mouse · FREE Liquid Cooling

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CORSAIR® 4GB DDR3 1600 Mhz Dual Channel Memory
500GB SATA III 6.0 7200 RPM HD 32MB Cache
AMD Radeon™ R7 360 4SGB Video
Logitech Wireless Game Controller
Syber Mini-ITX Gaming Case 350Watt

AMD 7.1 600 W · Syber® Wireless Keyboard · Logitech® Controller

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GIGABYTE® 970 USB 3.0 & SATA III
CORSAIR® 8GB DDR3 1600Mhz Dual Channel Memory
1TB SATA III HDD 7200RPM 64MB Cache
AMD Radeon™ R9 380 2GB Direct X 12 Video
Cyberpower X-Nova with 600Watt 80+ Power
Zalman Gaming Headset, Asetek Liquid Cooling System

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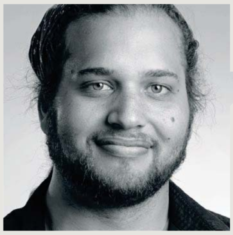
Work easy. Play hard. Windows



Alex Campbell

OPEN SOURCE

A hub for everything

THERE ARE SEVERAL PLACES on the Internet that have become workhorses for free and open-source software projects. GitHub is definitely one of them, and the more I dive into what the service offers, the more I love what it can do. If you're a Linux user, there's a very, very good chance you've heard of GitHub.

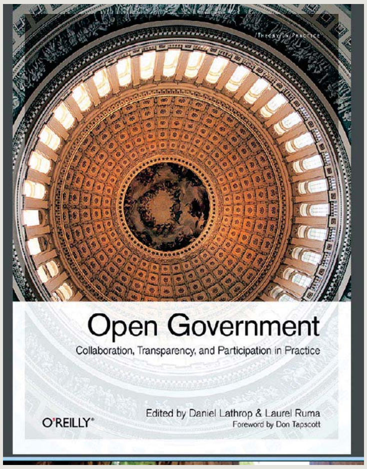
Hell, if you use any open-source software at all, there's a chance that you downloaded the software from the project's GitHub page.

If you're not familiar with GitHub, here's a quick familiarization: GitHub is a web service that hosts repositories for a program called Git. Git is a version control system (like Subversion or CVS) used by developers to check out, branch, and submit code to a project. While you can add binary resources (like images or executables) to a Git repository, the system is meant for plain text files. While GitHub isn't the only Git repository on the Web, it's popular because it offers free hosting to projects that are made public. (Private projects are $7 per month.)

Now, if you're not a programmer, you're probably wondering why Git is the bee's knees. So what if it lets developers develop software better? Why do I, as a user, care? Calm down, son. Git has more to offer than just versioning for programmers. As I dove into GitHub's explore feature, I found out that GitHub also hosts Git repos for documentation and books. Yes, you read that correctly, there are books on GitHub.

With a quick look, I found a 2010 book published by O'Reilly Media called Open Government (https://github.com/oreillymedia/open_government). The repository offers the book in ePUB, PDF, and MOBI formats, as well as the source files for each chapter in Markdown or AsciiDoc formats. I also saw programming tutorials for Node.js and C++ in other repos.

> If you're interested in learning to program, there are plenty of text resources you can use for free that are hosted on GitHub



Open Government

Collaboration, Transparency, and Participation in Practice

Edited by Daniel Lathrop & Laurel Ruma

Foreword by Don Tapscott

O'REILLY

Holy crap! Nobody told me I could find free e-books on GitHub.

If you're interested in learning to program, there are plenty of text resources you can use for free that are hosted on GitHub. However, one of the best ways to learn a new API or concept is through code examples. Since you can look at any of the code for projects hosted publicly on GitHub, you can use other projects as case studies. Of course, once you get your coding chops up to snuff, you can always submit code to your favorite project to squash a bug or make it better. If you remember one of my previous columns about using open-source to improve government, there are a few government projects that programmers can contribute to.

The Code for America repositories (https://github.com/codeforamerica) feature projects that include everything from adopt-a-hydrant (a program that lets users sign up to dig out fire hydrants after heavy snowfall) to CutePets (a Twitter bot that tweets information about adoptable pets). The General Services Administration's data.gov source code is also on GitHub, as is NASA's Mission Control Technologies.

If government coding isn't your thing, lots of companies and organizations have public repos for code contribution, too. Microsoft, Twitter, Adobe, Square, GNOME, Mozilla, Nginx, and Apache all have GitHub repos for various projects.

If you want to learn more about how to use Git, there are plenty of tutorials on the web. The most common way to use Git is through the command line (oh noes!), but don't let that scare you. And just in case you don't trust your project to a third party, you can always host your own Git repo on a local or Internet-facing server.

Alex Campbell is a Linux geek who enjoys learning about computer security.

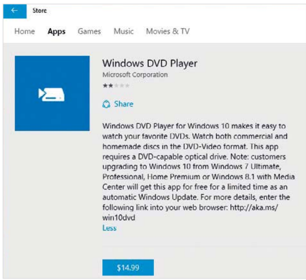
THE LIST

7 DRAWBACKS OF WINDOWS 10

7

DELETED FEATURES

Gadgets and WMC are gone, and the DVD Player sells for $15 in Windows Store.


Store
Home
Apps
Games
Music
Movies & TV
Share
Less
$14.99

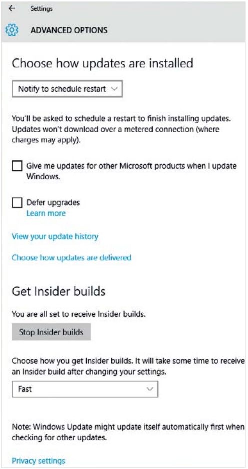
Windows DVD Player
Microsoft Corporation

Windows DVD Player for Windows 10 makes it easy to watch your favorite DVDs. Watch both commercial and homemade discs in the DVD-Video format. This app requires a DVD-capable optical drive. Note: customers upgrading to Windows 10 from Windows 7 Ultimate, Professional, Home Premium or Windows 8.1 with Media Center will get this app for free for a limited time as an automatic Windows Update. For more details, enter the following link into your web browser: http://aka.ms/win10dvd

6

FORCED UPDATES

By default, Windows 10 Home customers cannot opt out of possibly troublesome mandatory updates.


Settings
ADVANCED OPTIONS

Choose how updates are installed

Notify to schedule restart

You'll be asked to schedule a restart to finish installing updates. Updates won't download over a metered connection (where charges may apply).

☐ Give me updates for other Microsoft products when I update Windows.

☐ Defer upgrades
Learn more

View your update history

Choose how updates are delivered

Get Insider builds

You are all set to receive Insider builds.

Stop Insider builds

Choose how you get Insider builds. It will take some time to receive an Insider build after changing your settings.

Fast

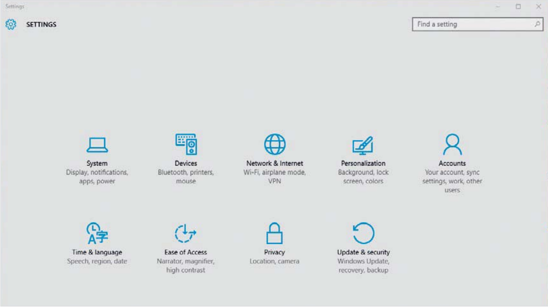
Note: Windows Update might update itself automatically first when checking for other updates.

Privacy settings

5

CONFUSING SETTINGS

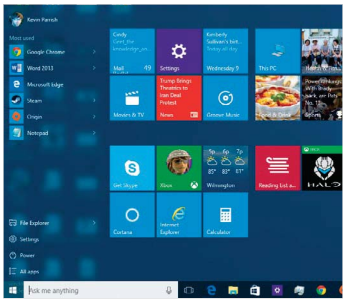
Windows 10 includes a Settings app and a secondary menu linking to the Control Panel.

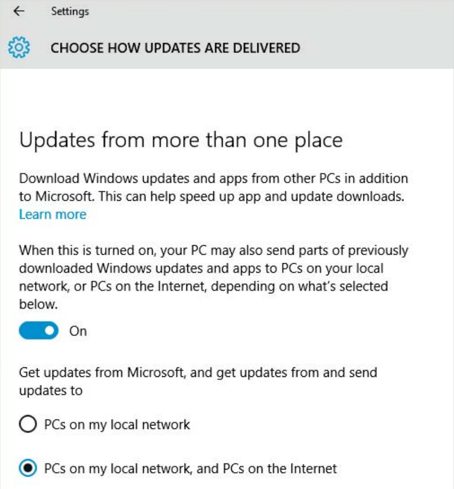

Settings
SETTINGS
Find a setting
System
Display, notifications, apps, power
Devices
Bluetooth, printers, mouse
Network & Internet
Wi-Fi, airplane mode, VPN
Personalization
Background, lock screen, colors
Accounts
Your account, sync settings, work, other users
Time & language
Speech, region, date
Ease of Access
Narrator, magnifier, high contrast
Privacy
Location, camera
Update & security
Windows Update, recovery, backup

4

CLUNKY START MENU

If you're used to Windows 7's Start menu, the Win10 version may feel crowded.


Kevin Parrish
Most used
Google Chrome
Word 2013
Microsoft Edge
Steam
Origin
Notepad
File Explorer
Settings
Power
All apps
Ask me anything
Cindy
Geet_the knowledge_an...
Mail 49
Settings
Kimberly Sullivan's birt...
Today all day
Wednesday 9
This PC
Health & Fitn...
Movies & TV
Trump Brings Theatrics to Iran Deal Protest
News
Groove Music
Food & Drink
Power rankings: With Brady back, are Pats No. 1?
Sports
Get Skype
Xbox
5p 6p 7p
85° 83° 81°
Wilmington
Reading List a...
HALO
Cortana
Internet Explorer
Calculator


Settings
CHOOSE HOW UPDATES ARE DELIVERED

Updates from more than one place

Download Windows updates and apps from other PCs in addition to Microsoft. This can help speed up app and update downloads.
Learn more

When this is turned on, your PC may also send parts of previously downloaded Windows updates and apps to PCs on your local network, or PCs on the Internet, depending on what's selected below.

On

Get updates from Microsoft, and get updates from and send updates to

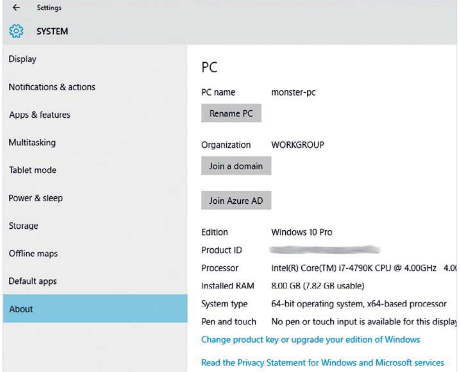
○ PCs on my local network

● PCs on my local network, and PCs on the Internet

3

WINDOWS 10 LOVES YOUR BANDWIDTH

By default, Windows 10 uploads updates to other customers, similar to the way P2P works.


Settings
SYSTEM
Display
Notifications & actions
Apps & features
Multitasking
Tablet mode
Power & sleep
Storage
Offline maps
Default apps
About
Rename PC
Join a domain
Join Azure AD

PC

PC name monster-pc

Organization WORKGROUP

Edition Windows 10 Pro
Product ID [redacted]
Processor Intel(R) Core(TM) i7-4790K CPU @ 4.00GHz 4.0
Installed RAM 8.00 GB (7.82 GB usable)
System type 64-bit operating system, x64-based processor
Pen and touch No pen or touch input is available for this display

Change product key or upgrade your edition of Windows

Read the Privacy Statement for Windows and Microsoft services

2

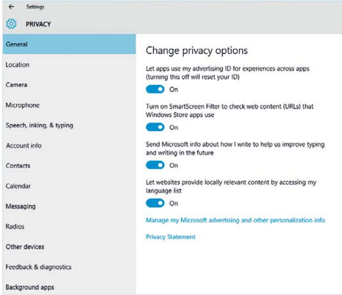
IT'S NOT TOTALLY FREE

You'll need a valid, genuine Windows key to get the free upgrade before July 2016.

1

PRIVACY

There's been a lot of controversy regarding the default privacy settings, and for good reason.


Settings
PRIVACY
General
Location
Camera
Microphone
Speech, inking, & typing
Account info
Contacts
Calendar
Messaging
Radios
Other devices
Feedback & diagnostics
Background apps

Change privacy options

Let apps use my advertising ID for experiences across apps (turning this off will reset your ID)
On

Turn on SmartScreen Filter to check web content (URLs) that Windows Store apps use
On

Send Microsoft info about how I write to help us improve typing and writing in the future
On

Let websites provide locally relevant content by accessing my language list
On

Manage my Microsoft advertising and other personalization info

Privacy Statement

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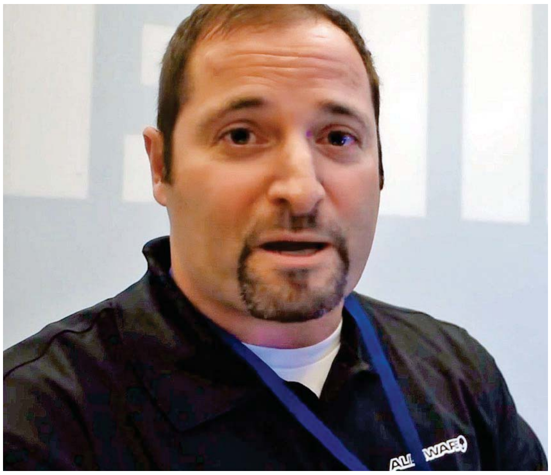
TALKING

BY **JIMMY THANG**

Alienware talks Steam OS and Steam Machines

With Valve aiming to take over your living room, is this the end of the console as we know it?

The PC gaming community has been waiting with bated breath to see how Valve will handle the transfer of keyboard-dedicated titles to the controller world. We spoke with Chris Sutphen, marketing manager at Alienware parent Dell, about the Steam revolution.



You're going to see a lot more AAA and Indie titles come to Steam OS over the course of this year, says Chris.

MPC: Can you tell us what we're looking at here?

Chris: Yeah, we're actually looking at the real life, fully functioning, Alienware Steam Machine. We're giving partners and press a behind the scenes look at a few games, and talking about what this really means for the PC gaming ecosystem.

MPC: You have the official Steam controller right?

Chris: Yes we do. So we've been playing on this for the past few days, we've been rocking a couple really fun local co-op games, we've been doing some first-person shooters, we've even been doing some games like *Cities: Skylines*. And that's really what we're here to talk about, is that Steam OS and the vision of the Steam Machine, is really adding to your PC ecosystem, and enabling you to play games that have traditionally been keyboard and mouse, but in a whole new fun way.

MPC: Will you be able to use the Steam controller on Windows?

Chris: Yep, the Steam controller is compatible with Windows 10, and the Steam OS will support Xbox controllers.

MPC: Can you tell us about the box Alienware has made?

Chris: Sure, for the Alienware Steam Machine we actually, in partnership with Valve and Gamestop, announced a pre-order program, which is very exciting. Because I think it definitively drew a line in the sand that said Steam Machines are here, they're a real thing, that the vision is going to be alive. And we announced that on November 10th people will be able to get the hardware in-store or online, but if they pre-order they'll be able to get it nearly a month in advance, so this is an early access program with limited supply.

MPC: So this is going to be running Steam OS?

Chris: This will be running Steam OS and we'll have four different configurations, the entry-level configuration is at a really nice beautiful price point of $449, and that comes with a controller. That is an Intel Core i3 processor, an Nvidia Geforce GPU, which is basically an 860M class performance card, four gigabytes of memory and a 500GB hard drive. Now I will say that with the Alienware Alpha in market, we've learned a little about what this system can and can't do, and we've heard very clearly that the 5,400 RPM drive in there wasn't meeting people's expectations, and so the hard drive that will be shipping in the Alienware Steam Machine is going to be 7200 RPM.

MPC: Are there going to be any SSD options?

Chris: No, no SSD options. But that being said, the Steam

Alienware's Steam Machine will come with various CPU and storage solutions, but no SSD

Machine is based on a PC architecture so there is full upgradability to it. Meaning that you could swap out the CPU, the hard drive, the memory and even the wireless cards if you want to.

MPC: Can you also get it with Windows installed?

Chris: The Alienware Steam Machine we're going to be shipping only with the Steam OS. It's our vision to bring the people what Steam OS can deliver in a 10 foot environment with the Steam controller and playing games in a very unique way. But if Windows is your cup of tea, and you want to stick with that, the Alienware Alpha will continue to stick around. And we'll continue to ship that with a Windows-based operating system.

Our Steam Machine has been a long time coming. We've been in partnership with Valve for over three years, and this is really a purpose built system. I mean the idea that you can actually take Steam OS and put it on any PC is great. But the idea that we took the time to purpose-build a system that is meant to be in the living room, I think adds a lot of value and credibility to how we're trying to extend your PC gaming experience. New games and old games are going to played in a whole new way with a whole new controller, and I believe that Alienware brings the price and the performance and the value to deliver that.

MPC: If you swapped out the hard drive and you wanted to put in your own SSD, how could we reinstall the Steam OS?

Chris: We're working on that right now, specifically trying to plan how we help Alienware Alpha users, maybe who have purchased the system knowing that it's Steam Machine ready. How can we help convert them to be a Steam OS user? We're working on some of those plans right now, and needless to say we'll absolutely support the warranty and make sure that's covered, but really it should be a pretty easy process upgrading from a Windows-based operating system to Steam OS. We'll put together some documentation to make sure that all our support teams know how to help customers do that.

MPC: Will you still be selling the Alpha console for Windows?

Chris: Yeah absolutely, Alpha will continue to live, will continue to be in the market. For Alienware it's all about enabling any type of PC gaming experience so, if you want to stick with Windows and you love the form factor go with Alpha. If you want to try Steam OS and you understand the value that it brings, and the unique gameplay you can get with the controller, we'll have that available in the fall as well.

MPC: You mentioned you can play keyboard and mouse games with the controller. Lots of people are a little skeptical about this.

Chris: Yeah, I'll be the first to say that I was skeptical as well. I came in and it took me a little bit of time to play with it, but I really really enjoy it, the haptic feedback that you get from the trackpad really works nicely as you emulate a mouse. We've actually been playing games like *Cities: Skyline* which is a very traditional PC mouse game, and we've been able to have a great time.

There's a little bit of a learning curve compared to an Xbox controller, it's a little bit bigger and the buttons are in a different place, so you have to get used to that. But when you understand the capability of unlocking new games and new genres from your PC gaming library to be played in the living room, it's a really fun experience. Me and the Alienware guys have been rocking some *Badland* here in local co-op mode, and that's truly what the system is about, being able to play games in any type of environment you like, in a fun way, with all your friends.

MPC: Is PC gaming ready to take over the living room?

Chris: You know, I wouldn't say that this is a flawless plan. I think what is exciting about it is that Valve is going to be able to uniquely shape your experience in a very quick and nimble way. They'll be able to add features and fix things very quickly on the fly, and as we get feedback from people who get to use these, and if you're lucky enough to get one in early access, as they start hitting the market later in November, we'll be able to work through some of those things and make sure that the experience is truly console-like.

MPC: The biggest obstacle seems to be Linux, the majority of the Steam library doesn't run on Linux.

Chris: I'll let our gaming publishers announce titles on their schedule, because it's their opportunity to do so, but myself and a few colleagues have been around the world talking to all of the major game publishers, and I will say that sharing news about the Alienware Steam Machine and our plans and how it'll be our flagship product, is getting those publishers excited to get their content library, whether it's back catalogue or new games that they'll be announcing, coming to Steam OS.

You're going to see over the summer a lot more titles and software, big AAA titles and indies, things that are going to be your favorite, are going to be coming to the Steam OS. I fundamentally believe that things like the Steam Machine are only as successful as some of the content that you can play on it.

So I have no fear or doubt that you're going to be able to play your favorite games in any of your favorite environments. And the Alienware Steam Machine can also stream any traditional title that is not Steam OS native, so with another rig in your house, you can stream that directly to your Steam Machine.

DOCTOR

THIS MONTH THE DOCTOR TACKLES...

> PCIe Bandwidth
> Non-Gaming Builds
> Platform Upgrade

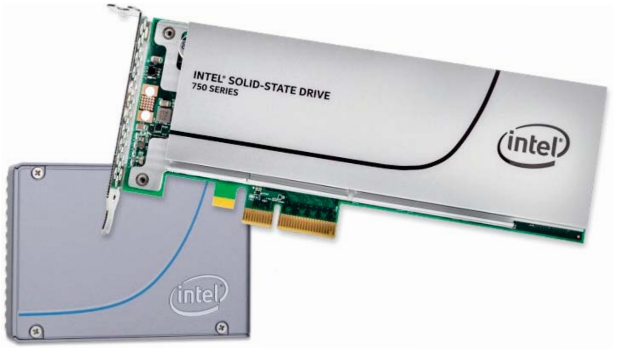
IDE To AHCI

Greetings Doctor. My PC has a 256GB SSD as its primary drive. Back when I installed it, I neglected to tell the BIOS to boot up in AHCI mode. There aren't a lot of clear guides on how to properly make this switch without reinstalling Windows, unfortunately. I know it involves a registry tweak and booting into safe mode to get the ACHI drivers loaded. But is this even recommended? Alternatively, when I make the jump to Windows 10, will I be able to finally tell my motherboard to boot in ACHI mode after a fresh installation?

–Kevin Bunkley

THE DOCTOR RESPONDS: To answer your first question, Kevin, yes, enabling the AHCI driver through your registry is a perfectly viable approach. In fact, Microsoft has a support page addressing this exact question at https://support.microsoft.com/en-us/kb/922976. There, you'll find a "Fix this problem" link able to make the tweak without your intervention. If you'd rather step through the process manually, start by opening regedit. Navigate to either "HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\Msahci" or "HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\IastorV," depending on the software you currently have installed. On the right-hand side of the window, under the column called "Name," you should see an entry titled "Start." Right-click it and choose the default option, "Modify." Make sure the Value data field is populated with a "0" and click OK. Close regedit and restart. AHCI enabled, turn it on in your firmware.

When you make the jump to Windows 10, there's a good chance you'll be upgrading. As far as the Doc knows, that process won't touch your BIOS. So make the switch to AHCI first, then install Windows 10.



Intel's SSD 750 sits on four lanes of third-gen PCI Express to deliver low latency and blistering storage performance.

Preventing Bottlenecks

I'm running a Core i7-4771 (Haswell) on an MSI Z97S SLI Plus motherboard with 16GB of memory, an Intel SSD 750 400GB drive, and a GeForce GTX 770 graphics card. I understand that the two PCIe slots are capable of supporting one device in x16 mode or two in x8. Am I limiting my Intel SSD or Nvidia GPU in any way? Second, does the LGA 2011 interface offer more lanes to the PCIe slots? I've read that they come with 40 lanes, but want to confirm the specifications.

–Robert Harris

THE DOCTOR RESPONDS: That SSD 750 definitely isn't limited in any way, Robert. It employs a four-lane interface, so a x8 link is more than enough. In theory, your GeForce card is getting less PCI Express bandwidth than it supports, but today's GPUs are not bottlenecked by PCIe throughput. Stick with one GTX 770 and you'll be fine.

Where you'll run into trouble is if you find yourself short on graphics processing power in the future. Although MSI's Z97S SLI Plus has three PCIe x16 slots, populating them all divides the CPU's PCI Express into one x8 and two x4 links. Nvidia doesn't allow SLI across four-lane connections, so you're forced to replace that GTX 770.

Enter the LGA 2011-v3 interface. Intel currently sells three different Haswell-E chips: Core i7-5960X, -5930K, and -5280K. Two sport 40-lane PCIe 3.0 controllers, while the last gives you 28 lanes. Depending on the motherboard, the highest-end models would let you run a pair of graphics cards in SLI using x16 links. The entry-level version gives you a pair of cards at x8 with the SSD 750 at x4 and lanes left over. Right now, though, there's really no reason to fret.

Why Gaming?

It seems like all of the kick-ass computer builds emphasize

↘ submit your questions to: doctor@maximumpc.com gaming. How about a state-of-the-art system built with video rendering, photography, and business in mind? I imagine it'd need the latest chipset, memory, and processor, but not expensive cooling or video cards. **–Bob Elman**

THE DOCTOR RESPONDS: Games are some of the most performance-sensitive applications available, so it's hardly a surprise that gamers tend to be first in line for hardware upgrades. But while 3D-heavy titles are biased to graphics processing, workstation software can tax your host processor, system memory, or even the storage subsystem.

The Doc's advice is to build your PC based on the applications you plan to run. Many rendering engines are tuned for multi-threaded CPUs, utilizing every core you throw at them. The same goes for popular video and photo editing apps, along with many coding suites. Increasingly, though, developers are getting big speed-ups from offloading their workloads to graphics resources, which handle certain parallelized tasks more efficiently. Just be careful—some optimizations are manufacturer- or API-specific. Know the features of your favorite software and you'll have the information needed to configure your next machine.

If you're looking for a general (and admittedly unguided) recommendation, try this on for size. The Doc likes Intel's Core i7-5820K with six cores and an unlocked multiplier. Load your favorite X99-based motherboard up with four 4GB DDR4 modules and drop in fairly high-end graphics card—GeForce GTX 770/Radeon R9 290 or better. Of course, if you're working in a modeling program that requires OpenGL, consider a Quadro or FirePro card instead. PCIe-attached SSDs are hot right now, but you'll be fine with a quick SATA drive. Just remember to add plenty of mechanical storage for all of those big project files. The result looks an awful lot like a gaming PC, but it's well-balanced for most pro uses too.

The Right BIOS Setting

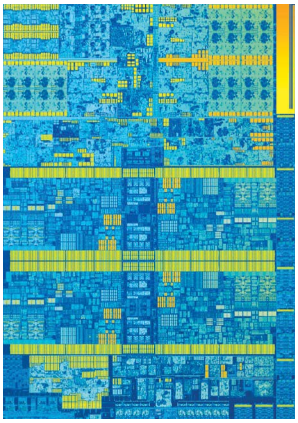
Hey Doc, I am upgrading my PC's hard drive to a SSD. From what I have found on the Internet, everyone recommends changing the BIOS settings to AHCI. I seem to have three options available: ICH SATA Control Mode, Onboard SATA/IDE Device, and Onboard SATA/IDE Ctrl Mode. Should all of these settings be changed to AHCI, or will IDE mode work fine? My motherboard is an older Gigabyte GA-EP45-UD3R running Windows 7 64-bit. **–Brett Walton**

THE DOCTOR RESPONDS: It looks like you're on the Integrated Peripherals page of your BIOS, which is correct. The latter two settings you refer to control Gigabyte's add-on SATA 2 controller. It's a discrete piece of logic separate from Intel's chipset. Assuming your hard drive is attached to one of the SATA2_0/1/2/3/4/5 ports, ignore those fields. Set the first one you mentioned (the manual refers to it as SATA RAID/AHCI Mode, but it might have been renamed ICH SATA Control Mode in a subsequent BIOS update) to AHCI.

If you do this before adding an SSD, the Windows installation on your existing disk will display an error as it tries to boot. That's because there's no AHCI driver installed. Fix that by following the Doc's instructions to Kevin Bunkley at the top of this month's column. Alternatively, switch to AHCI before swapping in the SSD and reinstalling Windows.

Windows 10 Upgrade

Dear Doctor, what is the best approach for upgrading a computer to Windows 10 and an NVMe-capable SSD once they're available? I want to retrofit my four-year-old machine running Windows 7 Ultimate, an Asus P8Z68 Deluxe, Core i5-2500K, Radeon HD 7900-series, 8GB of RAM, and Xonar Essence STX sound card. If I update to Windows 10 now and then install the new SSD later, will I need to reinstall Windows 7 in order to get Windows 10 back, or is there another approach? **–V Ryan**



Skylake offers improvements, but its supporting platform represents a more significant update for desktop enthusiasts.

THE DOCTOR RESPONDS: Good news, V. Windows 10 and NVMe-based SSDs are available and successfully being used together. If you update a retail copy of Windows 7 to Windows 10 now, it shouldn't be necessary to reinstall Windows 7 when you buy the SSD later (that may not be the case for OEM copies).

What happens, in theory, is that your update is initially activated online with Microsoft. From there, you can use the media creation tool, producing a thumb drive or DVD with the install routine on it. When you go to reinstall Windows on the same machine that was originally upgraded, you're able to skip entering the product key. Windows will activate itself automatically online.

There may be a twist as you start swapping out hardware, though. Microsoft's original verbiage stated that significantly changing a hardware configuration would trigger a re-activation (similar to previous versions of Windows), and that this would nullify the free upgrade offer. It's now suggested that a retail copy of the operating system can be transferred to this "new" PC. In either case, you'd be entitled to keep Windows 10, though it might be easiest to upgrade after installing the SSD.

Upgrade Paths

Hey Doc! I need your advice on a future upgrade, as I plan to replace my CPU and motherboard. I do a lot of Lightroom processing, some Photoshop, and very little gaming. I also stream movies to my PS3, browse the web of course, and rip Blu-ray movies to my hard drive for streaming. I looked at Intel's Core i7-4790K and Core i5-4690K. Would I see the difference between them in those applications? Can Lightroom/Photoshop use some GPU cycles to speed up?

My current specs include a Core i5-2500K at its stock clock rate, an Asus P8Z68-V LX motherboard, 16GB of G. Skill memory, an XFX Radeon HD 6870 1GB, Samsung's 840 120GB SSD, and a 3TB mechanical hard drive. Thanks for your help. **–Max Dufresne**

THE DOCTOR RESPONDS: Intel's Core i5-2500K remains a great processor, Max. It'd be disingenuous of the Doc to claim you'll feel the difference between it and a Haswell-based processor in most tasks. There are other reasons to upgrade platforms, though. By the time you read this, Intel's Skylake-based lineup should be available, and the Z170 chipset offers some I/O options not possible with the Z68 board.

Given the applications you run, a platform upgrade would probably be more meaningful than a new graphics card. However, Lightroom and Photoshop do utilize your GPU for certain functions. According to Adobe, Lightroom employs OpenGL 3.3 to accelerate adjustments in the Develop module. Photoshop has features accelerated by both OpenGL and OpenCL. If you make heavy use of those filters, then that 6870 might be hampering performance more than you might guess.

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73 POWER TIPS FOR WINDOWS 10

All the expert help and advice you need to master Microsoft's new operating system

By Mayank Sharma

16:11
13/07/2015
TouchSmart

With Windows 10, Microsoft wanted to combine the trustworthiness of Windows 7 with the revolutionary elements of Windows 8. What's more, users were given the chance to track the development of the OS with regular previews and then pass their feedback on to Microsoft.

There are many new features with Windows 10, but we also see the return of some old favorites, including the Start menu and Backup. Look out for tips throughout the next few pages on all of those and more. Elsewhere, Microsoft has stressed it hasn't given up on the touch interface it introduced in Windows 8. But, thanks to its commitment to the trusty old keyboard and mouse, Windows 10 makes just as much sense on the desktop as it does on touch-based devices.

In essence, Windows 10 looks, feels, and works like a polished version of Windows 7. Microsoft has also managed to shed some of the universally panned features of Windows 8, such as the (ironically named) Charms bar, plus it's made the useful ones more customizable. The release also features new Universal Apps, which have the ability to go full-screen. Overcoming the shortcomings of their earlier incarnations, these apps now function consistently, even between different devices.

While Windows 10 is easily the best version of Windows yet, there are still plenty of hints and tips we can give you to make it even better. Indeed, we've got 73 of them, so get ready to take Windows 10 to a whole new level with our essential power tips!

TAKE CHARGE OF THE START MENU

RESIZE THE START MENU

You can manually resize the Start menu as you would any other window. Just grab an edge and drag it to the new size. You can only resize it up or down, left or right. There's no option to drag it diagonally.

ADD LIBRARIES

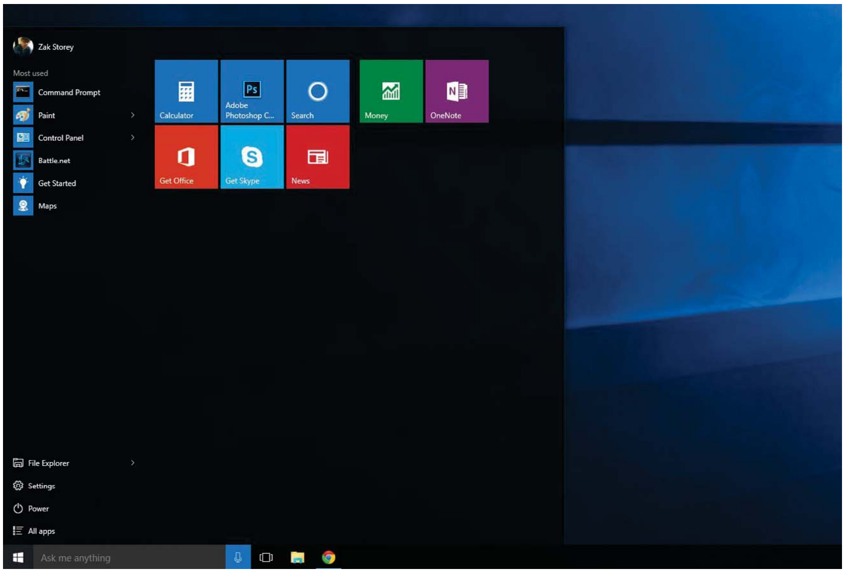
By default, the Start menu only displays links to the Settings app and File Explorer. To display Libraries in the Start menu, head to "Start → Settings → Personalization → Start" and click the "Customize list" link.

REARRANGE TILES

You can move tiles around the Start menu in much the same way you could in Windows 8.1. Just click, hold, and drag. If they're Microsoft tiles, you can also resize them in one of the four preset sizes. If they're tiles you've pinned yourself, there are two preset sizes.

HIDE YOUR RECENTLY OPENED PROGRAMS

If you don't want the Start menu to show your recently opened programs and files, head to "Settings → Personalization → Start" and uncheck the "Store and display recently opened programs in the Start Menu" option.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Ask me anything

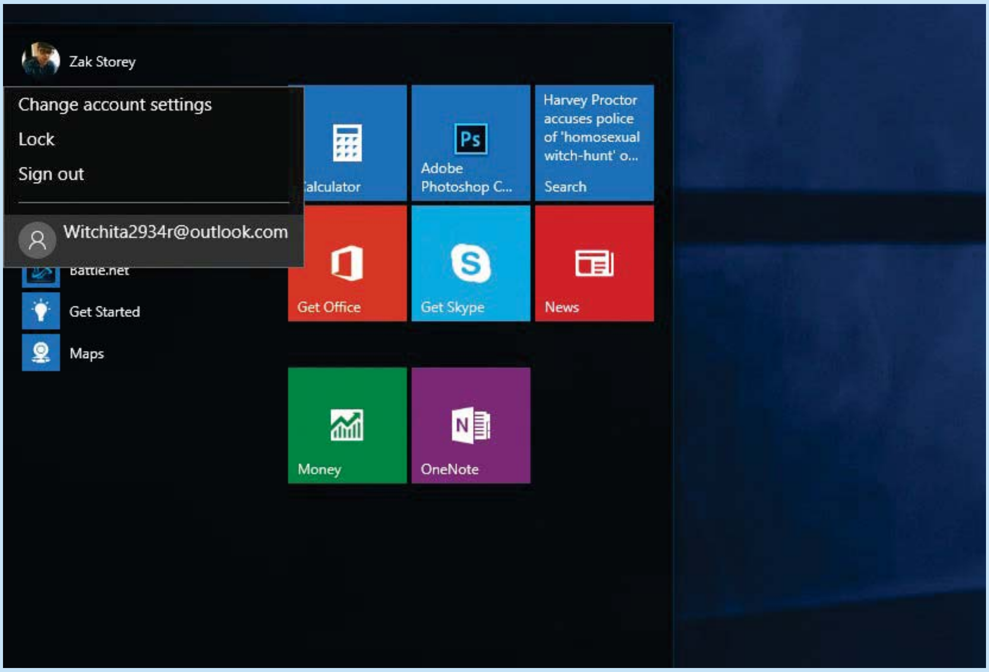
There are stacks of customization options to get the Start menu exactly how you want it.

NAME TILE GROUPS

By default, the Start menu arranges all of your tiles within two groups: "Life at a glance" and "Play and explore." Click their titles to rename them. If you've pinned tiles of your own, hover over the area above them and click the two parallel lines to give that group a new name.

ADD YOUR APPS AND FOLDERS TO TILES

Right-click any of your folders and select the "Pin to Start" option to create a tile for it within the Start menu. Then follow the previous steps to rename and reposition it. You can also do the same for any app that is listed under the "All apps" menu.


Zak Storey
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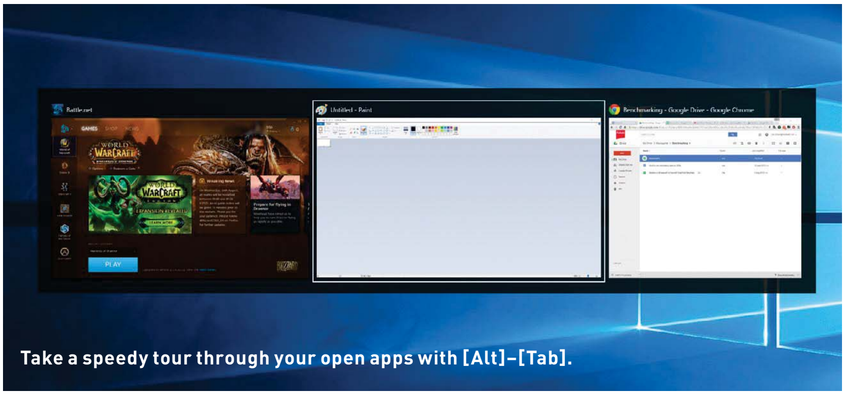
SIGN OUT OF WINDOWS

If you need to sign in as another user, bring up the Start menu and click your name, which is displayed right at the top. This brings up a menu that includes the option to sign out and then back in again as another user.

WINDOWS DESKTOP AND FILE EXPLORER



Take a speedy tour through your open apps with [Alt]–[Tab].

NEW APP SWITCHER

Press Alt + Tab to switch between open windows and apps. You'll see thumbnails of programs that are running—cycle through them using the Tab key.

MULTIPLE INTERFACES

Windows 10 automatically changes the interface based on the type of device you're using, thanks to Continuum. The OS also detects screen size and tailors the display accordingly.

PIN FOLDERS

You can manually pin folders for quick access. Just right-click any folder, and choose "Pin to Quick access." To remove a folder from Quick Access, right-click and choose "Unpin from Quick Access."

REORDER ALL OF YOUR PINNED FOLDERS

To change the order in which folders are listed in the Quick Access view, simply select a folder and drag it above or below the other listed folders.

TURN OFF THE QUICK ACCESS VIEW

Open File Explorer, then select "View → Options from the Ribbon." In the "Folder Options" window, click the "Open File Explorer to" drop-down menu at the top and select the "This PC" option.

PEEK INSIDE DESKTOPS

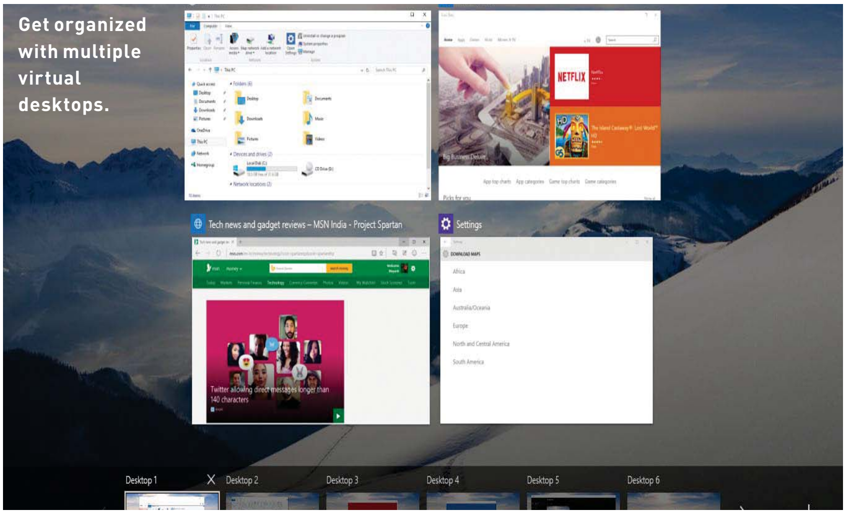
Bring up the Task View and hover over a virtual desktop to view all windows running inside it. Click the app preview from the Task View to bring that window straight to the top.

MOVE A WINDOW TO ANOTHER DESKTOP

To move windows, bring up the Task View and drag an open window from the current desktop straight into the desktop you want to move it to. Alternatively, you can drag a window to the "new desktop" button to create a new virtual desktop for the window. If you have a high-resolution monitor, right-click the Taskbar and go to "Properties." Then use the "Taskbar buttons" menu to select the "Combine when Taskbar is full" option.

VIEW APPS FROM ACROSS MULTIPLE DESKTOPS

By default, the Taskbar displays windows and apps from the current desktop. To change this, head to "Start → Settings → System → Multi-tasking → Virtual Desktops" and select the "All desktops" option from the drop-down menu.



Get organized with multiple virtual desktops.

DECLUTTER YOUR TASKBAR

If you don't use virtual desktops or use the keyboard to switch between them, you can hide the Task View icon by right-clicking the Taskbar and deselecting the "Show Task View button" option.

MAKE TASKBAR OPAQUE

Go to "Start → Settings → Personalisation → Colors" and disable "Make Start, Taskbar and Action Center transparent" to remove the see-through effect in favor of an opaque background for the Start menu and Taskbar.

PUT THE RECYCLE BIN ON THE TASKBAR

Instead of always poking around the Explorer or minimizing open windows to find the Recycle Bin icon on the Desktop, you can now simply right-click the icon and then pin it to the Start menu as well as the Taskbar.

DISABLE NOTIFICATIONS TEMPORARILY

Avoid distraction by temporarily disabling notifications from Action Center. Just right-click the Action Center icon in the Taskbar and head to "Hide notifications for" and choose between one, three, or eight hours.

ADD MULTIPLE DESKTOPS

You can now add multiple virtual desktops. To do this, click the "Task View" button on the Taskbar, then click "New desktop." You can add as many as you like and scroll through them if they extend beyond the space on your desktop.

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WINDOWS APPS AND CORTANA

PIN WEBSITES

You can use the Microsoft Edge browser to pin websites and webpages to the Start menu for quick access. Simply open the website you want to pin and click the "More actions" button (the three dots), then select "Pin to Start."

READING VIEW

Edge also has a distraction-free view for reading web pages. Switch to it by clicking the "Reading View" icon, or press Ctrl + Shift + R. To configure it, go to "More options → Settings" and scroll down to the "Reading" section.

SAVE WEB PAGES TO READ THEM LATER

To save web pages for viewing later, click the "Star" icon, scroll to "Reading list," and click "Add." When you've found the time to read them, click the "Hub" icon (the folder with the star) and select "Reading list."

CLEAR POP-UP EXCEPTIONS

To clear pop-up permissions for websites, head to "More actions → Settings → Choose what to clear" under "Clear browsing data." Expand "Show more" and tick the "Pop-up exceptions" checkbox.

CORTANA AT YOUR SERVICE

One of the biggest additions to Windows 10 is the debut of its integrated digital personal assistant, Cortana, which is built straight into the desktop and sits in the Taskbar. Cortana shows up as circles that pulse or spin when activated.

HEY, CORTANA

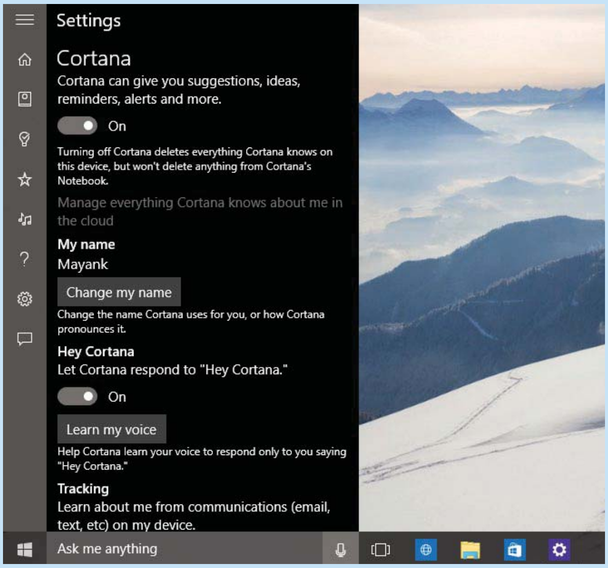
To enable voice activation for Cortana, click the search box in the Taskbar and click the menu icon in the top-left corner. Now choose "Settings" and then enable the "Let Cortana respond when you say 'Hey Cortana'" option.

TRAIN CORTANA TO RESPOND TO YOUR VOICE

You can teach Cortana to only respond to your voice. Click the "Search" icon and go to "Settings" (the gear icon), then click the "Learn my voice" button.

PLAY MUSIC ACROSS YOUR DEVICES

Upload music to OneDrive either from the website or by copying it into the OneDrive folder. Then sign into your Groove Music



Settings

Cortana

Cortana can give you suggestions, ideas, reminders, alerts and more.

On

Turning off Cortana deletes everything Cortana knows on this device, but won't delete anything from Cortana's Notebook.

Manage everything Cortana knows about me in the cloud

My name
Mayank

Change my name

Change the name Cortana uses for you, or how Cortana pronounces it.

Hey Cortana
Let Cortana respond to "Hey Cortana."

On

Learn my voice

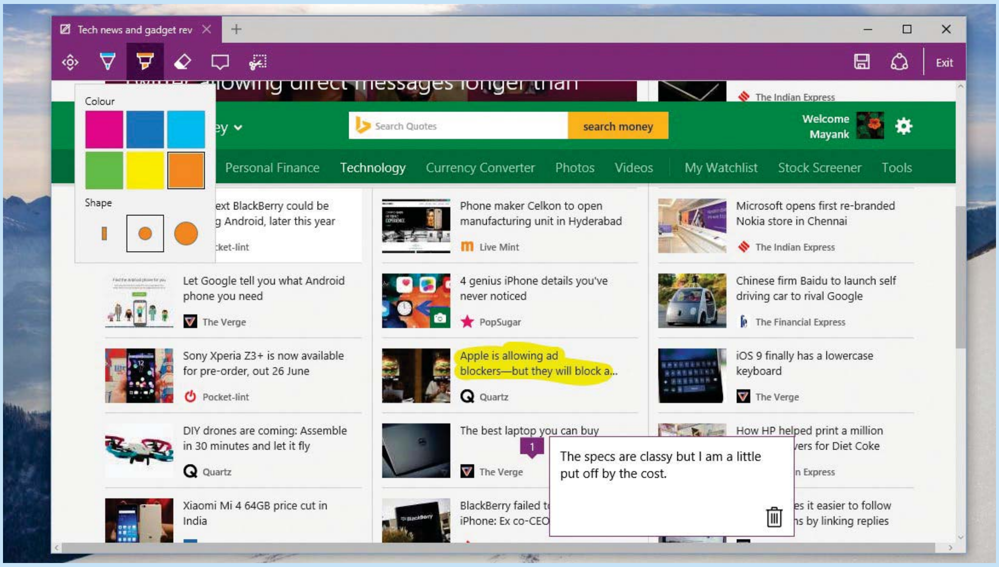
Help Cortana learn your voice to respond only to you saying "Hey Cortana."

Tracking
Learn about me from communications (email, text, etc) on my device.

Ask me anything

USE CORTANA

To summon up your updated digital personal assistant, Cortana, click the Search bar in the Taskbar. Or, you can use Win + C to launch its speech recognition ability, ask it questions, set some reminders, and carry out other common tasks.



Tech news and gadget rev

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Microsoft opens first re-branded Nokia store in Chennai — The Indian Express

Chinese firm Baidu to launch self driving car to rival Google — The Financial Express

iOS 9 finally has a lowercase keyboard — The Verge

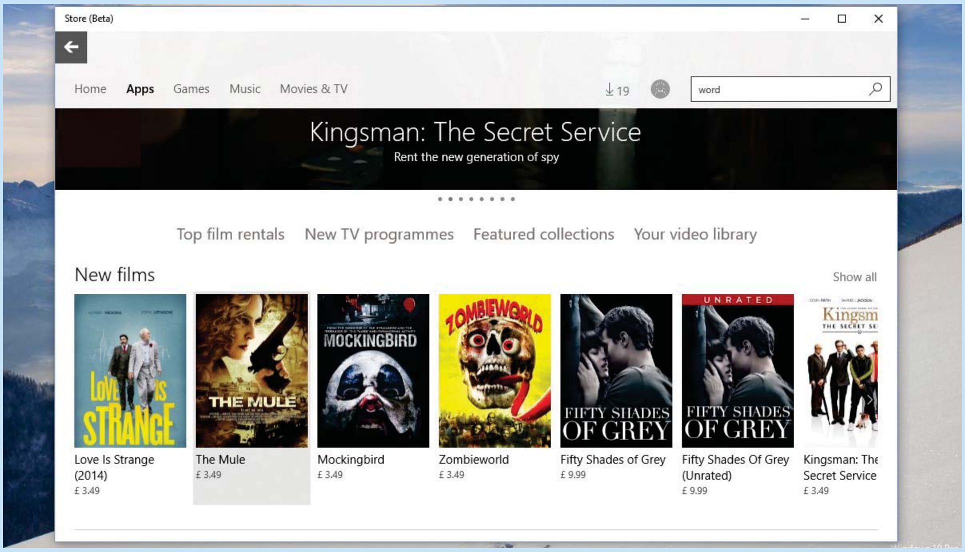
The specs are classy but I am a little put off by the cost.

DRAW DIRECTLY ON A WEB PAGE

One of the most touted features of Microsoft's new Edge browser is its ability to let you write notes, draw doodles, and highlight text on any web page. The Web Note icon brings up a tool palette so you can scribble away on web pages.

BUY MUSIC AND VIDEOS

The Windows Store now has a broader range on offer and, as well as apps, it also lets you shop for games, music, movies, and TV shows. You can browse and purchase music from the Music page and buy and rent videos and TV shows from the "Movies & TV" page.



Kingsman: The Secret Service
Rent the new generation of spy

New films

Love Is Strange (2014) £ 3.49
The Mule £ 3.49
Mockingbird £ 3.49
Zombieworld £ 3.49
Fifty Shades of Grey £ 9.99
Fifty Shades Of Grey (Unrated) £ 9.99
Kingsman: The Secret Service £ 3.49

app, Windows Phone, or another Windows PC with the same Microsoft account and the music files will automatically sync and be listed in your collection.

MANAGE PHOTOS WITH ONEDRIVE

If you have a large collection of images spread across devices, including iOS and Android, you can combine them via OneDrive, which will also remove any duplicates for you.

DISABLE THE PHOTOS APP'S AUTO-ENHANCE

The Photos app is configured to auto-enhance your pictures. If you want to leave your pictures as they are, open the app's Settings (the gear icon) and head to the "Viewing & Editing" section. Here you can turn off the "Automatically enhance your photos" option.

PIN EMAIL FOLDERS

Launch the Mail app and click "More" to view all folders in your inbox. Right-click a folder and select "Pin to Start" to add a tile in the Start menu that takes you straight to this folder in the Mail app.

TRY THE TOUCH-FRIENDLY OFFICE APPS

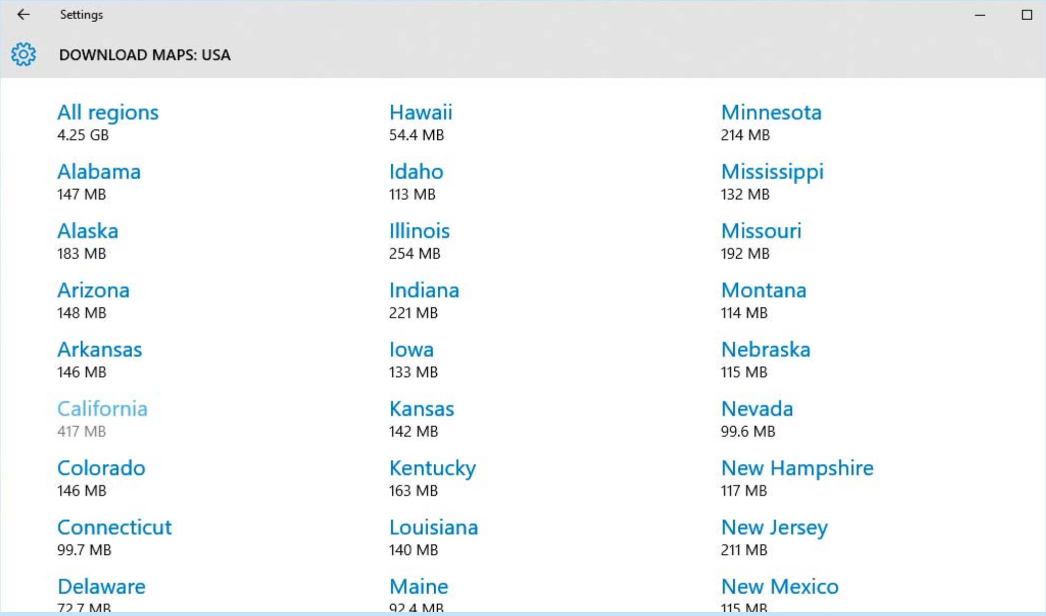
Until they're officially released later in the year, you can test the beta previews of Word, Excel, and PowerPoint for free. These universal Office apps are optimized for touch and mobile use (without keyboard or mouse), and can be found in the Store.

SEAMLESSLY INTEGRATE WITH GOOGLE CALENDAR

The new Windows 10 Calendar app also has support for Google Calendar. This means you can cut down on confusion and pull in all of your existing calendar entries. Just head to "Start → Settings → Accounts → Add account" and select Google to connect to the service.

SUPPORT FOR ANDROID AND IPHONE

A real strength of Windows 10 is its integration abilities. The Phone Companion app is designed to help users sync content between their PC and mobile phones (be it Windows Phone, Android, or iOS) by helping you install all of the required components from the respective official app stores.



DOWNLOAD MAPS: USA

All regions	4.25 GB
Alabama	147 MB
Alaska	183 MB
Arizona	148 MB
Arkansas	146 MB
California	417 MB
Colorado	146 MB
Connecticut	99.7 MB
Delaware	72.7 MB
Hawaii	54.4 MB
Idaho	113 MB
Illinois	254 MB
Indiana	221 MB
Iowa	133 MB
Kansas	142 MB
Kentucky	163 MB
Louisiana	140 MB
Maine	92.4 MB
Minnesota	214 MB
Mississippi	132 MB
Missouri	192 MB
Montana	114 MB
Nebraska	115 MB
Nevada	99.6 MB
New Hampshire	117 MB
New Jersey	211 MB
New Mexico	115 MB

GET MAPS TO USE OFFLINE

The Maps app includes an offline feature. Go to "Start → Settings → System → Offline Maps" and click the "Download Maps" button. Now, drill down to the location that you need the map for.

SETTINGS & TWEAKS

BYPASS SIGN-IN

To log straight into Windows, type **netplwiz** into the Cortana search bar. This will bring up the User Accounts window. In the Users tab, deselect the "Users must enter a username and password to use this computer" option.

SELECTIVELY SYNC FOLDERS WITH ONEDRIVE

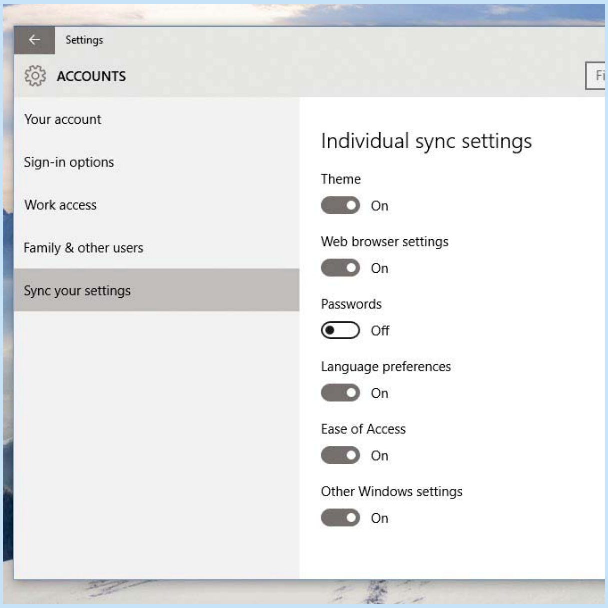
OneDrive is now more flexible and user-friendly. To customize the folders that it syncs, right-click the icon in the notification area, select "Settings," switch to the "Choose folders" tab, and click the "Choose folders" button, to select which cloud folders you want to be available locally.

ACCESS FILES REMOTELY

Under the Settings tab, if you toggle the "Let me use OneDrive to fetch any of my files on this PC" option, then you can easily access any of the files that you've stored in the cloud from any other computer connected to the web, simply by logging into the OneDrive website (www.onedrive.com).

BRING THE APP ICONS BACK

Tablet Mode hides the app icons in the Taskbar, but you can bring them back for faster access. Right-click "Tablet Mode" in Action Center and click "Go To Settings." Here, disable the "Hide app icons on the Taskbar when in Tablet Mode" option.



Individual sync settings

Theme
On

Web browser settings
On

Passwords
Off

Language preferences
On

Ease of Access
On

Other Windows settings
On

CUSTOMIZE SYNC SETTINGS

To take charge of the settings that synced from the current installation to your online account, head to "Start → Settings → Accounts → Sync your settings" and disable any of the listed settings that you don't want to be synced with your Microsoft account.

DISABLE TASKBAR SEARCH

If you don't use the Taskbar search that often and would rather preserve the space for something else, right-click the Taskbar, select "Search," and select "Show search icon" to replace the bar with a smaller magnifier icon, or "Disabled" to remove it from the Taskbar entirely.

CHANGE SIGN-IN OPTIONS

To switch to an alternative login mechanism, head to "Start → Settings → Accounts → Sign-in options." From here you can replace the password with an easier-to-remember four-digit PIN or a picture password, if you prefer.

HELLO WINDOWS

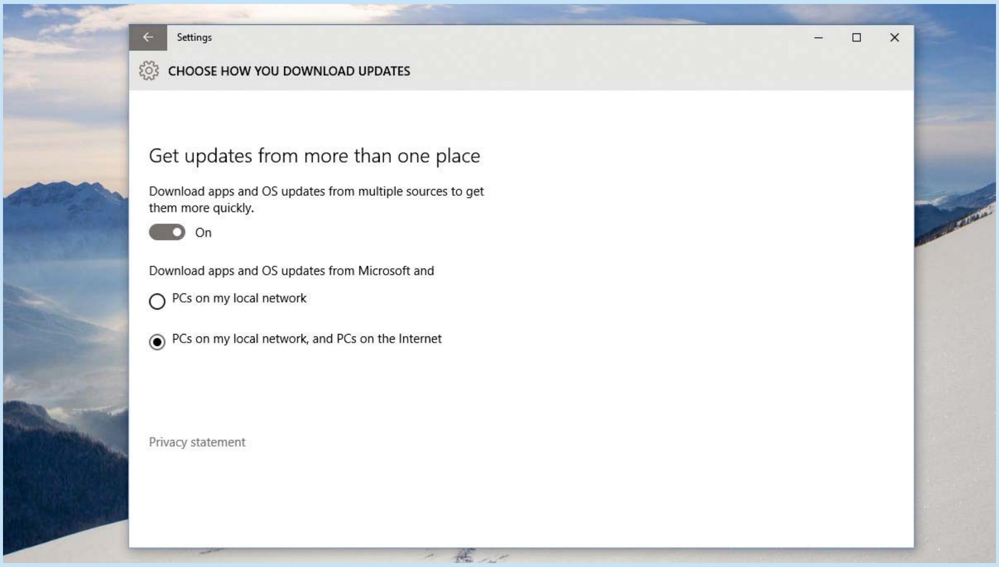
The "Hello" sign-in feature logs you in without a password. It cleverly uses biometric authentications, such as your face, iris, or finger, to know who you are. You can set it up by heading to "Start → Settings → Accounts → Sign-in options."

CUSTOMIZE PRIVACY

Head to "Start → Settings → Privacy." Here, you can manage general, app-specific, and hardware-specific privacy options, as well as individually define which apps can access the connected hardware.

DISPLAY A LOGIN MESSAGE

Type **secpol.msc** in the Run window and head to "Local Policies →



Get updates from more than one place

Download apps and OS updates from multiple sources to get them more quickly.

On

Download apps and OS updates from Microsoft and

○ PCs on my local network

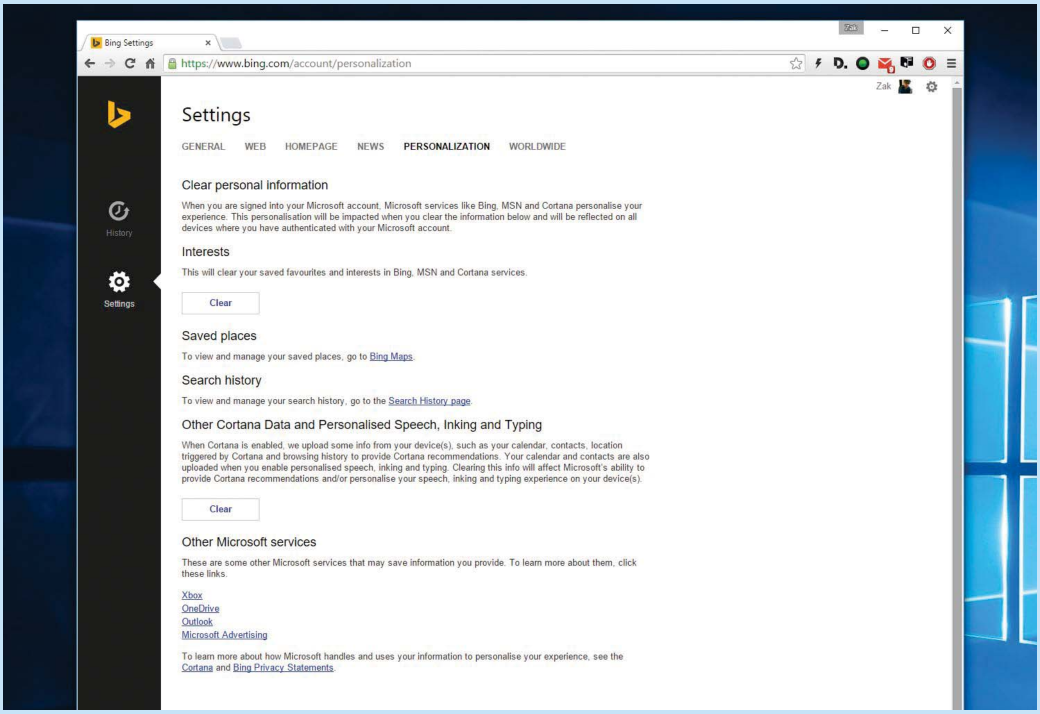
● PCs on my local network, and PCs on the Internet

PEER-TO-PEER UPDATES

Microsoft now lets you download updates using peer-to-peer technology. The option is enabled by default, but you can tinker with the setting. Head to "Start → Settings → Update & security → Windows Update → Advanced Options → Choose how you download updates."

BRAINWASH CORTANA

To reset Cortana, head to "Cortana → Settings" and click the "Manage everything Cortana knows about me in the cloud." Click "Clear" to wipe everything that Cortana has stored about you.



Settings

Clear personal information

When you are signed into your Microsoft account, Microsoft services like Bing, MSN and Cortana personalise your experience. This personalisation will be impacted when you clear the information below and will be reflected on all devices where you have authenticated with your Microsoft account.

Interests

This will clear your saved favourites and interests in Bing, MSN and Cortana services.

Saved places

To view and manage your saved places, go to Bing Maps.

Search history

To view and manage your search history, go to the Search History page.

Other Cortana Data and Personalised Speech, Inking and Typing

When Cortana is enabled, we upload some info from your device(s), such as your calendar, contacts, location triggered by Cortana and browsing history to provide Cortana recommendations. Your calendar and contacts are also uploaded when you enable personalised speech, inking and typing. Clearing this info will affect Microsoft's ability to provide Cortana recommendations and/or personalise your speech, inking and typing experience on your device(s).

Other Microsoft services

These are some other Microsoft services that may save information you provide. To learn more about them, click these links.

Xbox
OneDrive
Outlook
Microsoft Advertising

To learn more about how Microsoft handles and uses your information to personalise your experience, see the Cortana and Bing Privacy Statements.

Security Options." Find "Interactive Logon: Message title for users attempting to log on," plus "Interactive Logon: Message text for users attempting to log on." Right-click these, hit "Properties" and type in your message.

CHANGE YOUR COMPUTER NAME

Head to "Start → Settings → System → About" and click the "Rename PC" button. You'll have to restart your PC to bring this change into effect.

CHANGE NOTIFICATION CENTER ICONS

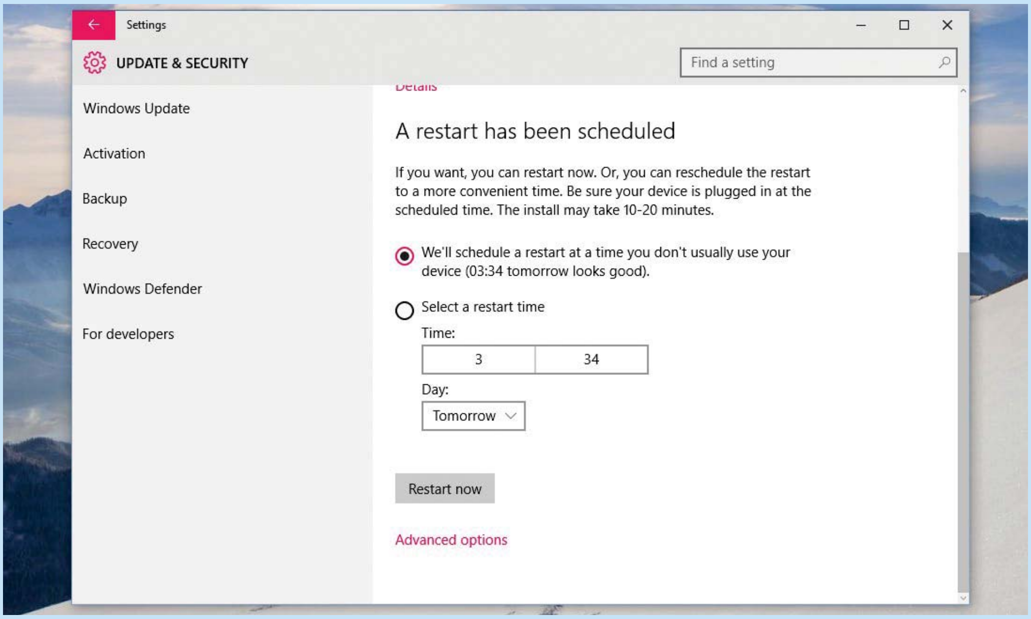
To customize the quick action icons that are displayed in the Notification Center, head over to "Start → Settings → System → Notification & actions," and then click the four icons displayed to select a different icon from a drop-down list.

KNOW WHICH APPS ARE DRAINING YOUR BATTERY

Under "System → Battery saver → Battery use" you can check how much energy is wasted on background processes. If this number is larger than you'd like, you might want to have a detailed look at what's starting up with Windows.

EXTEND BATTERY LIFE

Limit background activity to extend battery life, especially if the previous tip reveals a large number of things going on. Go to "Start → Settings → System → Battery saver → Battery saver settings," check the box to enable the feature, and pick a percentage at which you want it to kick in.



A restart has been scheduled

If you want, you can restart now. Or, you can reschedule the restart to a more convenient time. Be sure your device is plugged in at the scheduled time. The install may take 10-20 minutes.

● We'll schedule a restart at a time you don't usually use your device (03:34 tomorrow looks good).

○ Select a restart time

Time: 3 34

Day: Tomorrow

SCHEDULE RESTARTS

To restart the PC and install updates at chosen times, head to "Start → Settings → Updates and Security → Windows Update → Advanced Options." Under the "Choose how updates are installed" pull-down menu, select the "Notify to schedule restart" option.

ADVANCED TRICKS

IMPROVED COMMAND PROMPT

The oft-ignored PowerShell also gets a slew of new features to make it more user-friendly. It now supports word wrap and you can resize it, which also increases its buffer size. It also has much-improved keyboard controls for editing and selection.

ACCESS "GODMODE"

A long-time favorite of the power user, "GodMode" unveils a Power User menu that brings together all your system's far-flung settings and configuration options into one single location. Just create a new folder and rename it **GodMode.{ED7BA470-8E54-465E-825C-99712043E01C}**.

GET RID OF OLD STUFF

If you have no intention of reverting to the previous version of Windows, save disk space by getting rid of the old OS files. Head to "Control Panel → System and Security → Administrative Tools → Disk Clean-up" and tick "Previous Windows installations."

CUSTOMIZE THE DISK SPACE FOR PROTECTION

To customize the disk space for protection, first launch the Control Panel and head to "System and Security → System → System protection." Now click "Configure" (under "Protection Settings") and use the slider next to "Max Usage" as you need to.

SPEED UP APP LAUNCHES AT BOOT

On a fast machine, you can disable the app startup delay. Launch regedit and then navigate to "HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer." Right-click Explorer, select "New → Key," and name it "Serialize." Under this key, create a DWORD value called **StartupDelayInMSec** and set it to "0."

REGISTRY EDITOR!

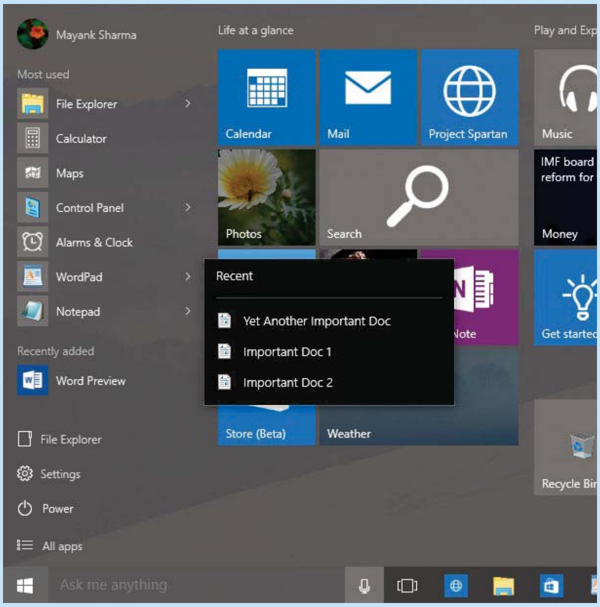
Power users rejoice! Microsoft has finally decided to spend some time improving the Registry Editor. It now lets you jump between the same entries under "HKEY_LOCAL_MACHINE" and "HKEY_CURRENT_USER" using a special context-menu entry.

MOUNT ISO IMAGES

You don't need any third-party software to browse the contents of an ISO image. Right-click it and hit "Mount." The ISO images are mounted as virtual discs and you can access them from the File Explorer.

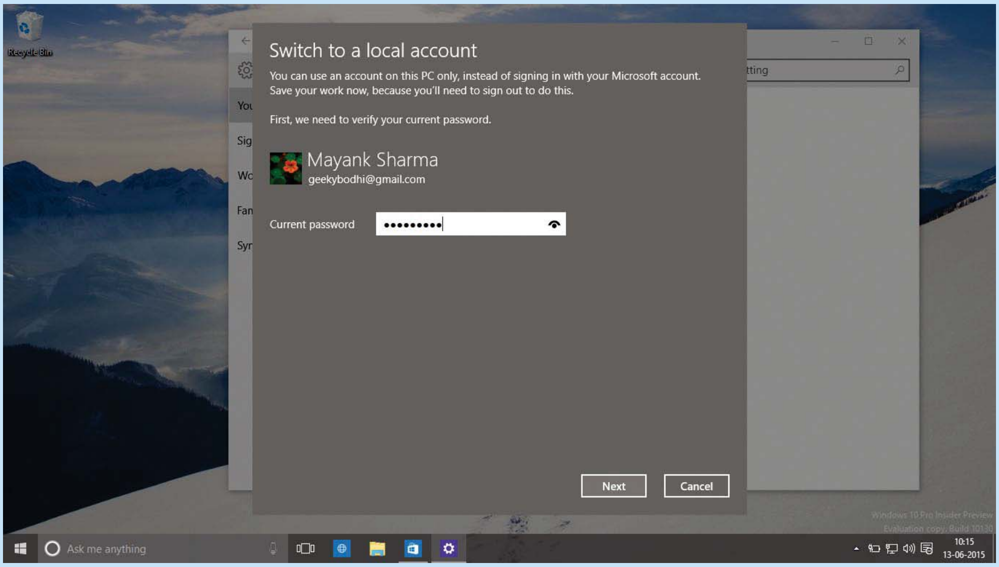
RESTART EXPLORER

To quickly apply changes that require restarting the computer, launch the Task Manager by right-clicking the Taskbar. Click the "More Details" button and under the "Processes" tab look for an entry named "Windows Explorer." Then right-click it and select "Restart."


Mayank Sharma
Life at a glance
Play and Exp
Most used
File Explorer
Calculator
Maps
Control Panel
Alarms & Clock
WordPad
Notepad
Recently added
Word Preview
File Explorer
Settings
Power
All apps
Ask me anything
Calendar
Mail
Project Spartan
Music
IMF board reform for
Money
Photos
Search
Recent
Yet Another Important Doc
Important Doc 1
Important Doc 2
Note
Get started
Store (Beta)
Weather
Recycle Bi

JUMP LISTS IN START MENU

Save time by using Jump Lists with your most-used apps. In Registry Editor, head to "HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\Advanced" and create a new DWORD named **EnableXamlJumpView** and set its value to "1." Then restart your PC.



Switch to a local account

You can use an account on this PC only, instead of signing in with your Microsoft account. Save your work now, because you'll need to sign out to do this.

First, we need to verify your current password.

Mayank Sharma
geekybodhi@gmail.com

Current password: •••••••••

Recycle Bin
Next
Cancel
Windows 10 Pro Insider Preview
Evaluation copy. Build 10130
Ask me anything
10:15
13-06-2015

CREATE A LOCAL ACCOUNT

If you don't want the benefits of a OneDrive-synced account, you can create a standalone offline account. Head to "Start → Settings → Accounts" and click the "Sign in with a local account instead" link.

ZALMAN

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www.zalman.com

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EBT SERIES
POWER SUPPLY
ZM1000-EBT
Peripherals / IDE / S-ATA
CPU / PCI-E

ZM1000-EBT

Fullly Modular & 80 PLUS GOLD Rated

*Available in 1000W and 850W. The 750W and 650W EBT PSUs are 80 Plus Gold rated and semi-modular

Z11 NEO
Mid Tower ATX Case

H1
Full Tower ATX Case

ZM-K700M
Mechanical Keyboard

ZM-GM4
Custom Fit Mouse

CNPS10X OPTIMA
Performance CPU Cooler

newegg.com www.newegg.com
Fry's Electronics www.fryselectronics.com
amazon.com www.amazon.com
Memory Express Computer & Products Inc. www.memoryexpress.com
Micro Center computers & electronics www.microcenter.com
NCIX.com Great Technology, Selection & Service www.ncix.com
DIRECTRON.COM Computer Super Store www.directron.com
Quiet PC hear yourself think www.quitepc.com

ADVANCED TRICKS

CREATE A RECOVERY DISC

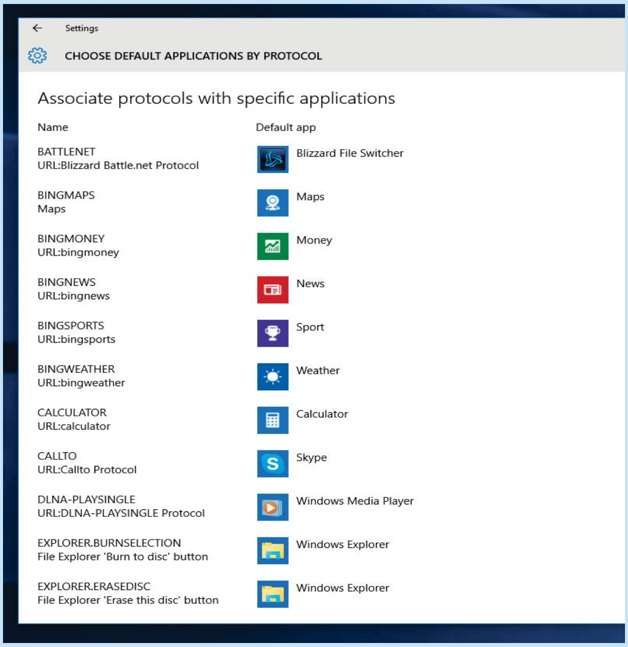
Plug in a USB drive and head to "Start → Settings" and type **recovery** in the "Find a setting" textbox and select the "Create a recovery drive" option. This will launch a wizard that wipes the USB drive and transforms it into a recovery drive.

CREATE A SYSTEM IMAGE

Head to "Start → Settings," type **file** in the textbox and select the "File History" tool. Then click the "System Image Backup" link so you can select the destination drive for storing the backup image.

CUSTOMIZE THE POWER USER MENU

To reorganize or remove entries in the Power User menu, go to "C:\Users\<username>\AppData\Local\Microsoft\Windows\WinX." You'll notice three folders that house entries for the Power User menu. You can move any of them around or remove them as per your requirements.



CHOOSE DEFAULT APPLICATIONS BY PROTOCOL

Associate protocols with specific applications

Name	Default app
BATTLENET URL:Blizzard Battle.net Protocol	Blizzard File Switcher
BINGMAPS Maps	Maps
BINGMONEY URL:bingmoney	Money
BINGNEWS URL:bingnews	News
BINGSPORTS URL:bingsports	Sport
BINGWEATHER URL:bingweather	Weather
CALCULATOR URL:calculator	Calculator
CALLTO URL:Callto Protocol	Skype
DLNA-PLAYSINGLE URL:DLNA-PLAYSINGLE Protocol	Windows Media Player
EXPLORER.BURNSELECTION File Explorer 'Burn to disc' button	Windows Explorer
EXPLORER.ERASEDISC File Explorer 'Erase this disc' button	Windows Explorer

CHOOSE DEFAULT APPS BY PROTOCOL

To define default apps based on their protocols, head to "Start → Settings → System → Default apps." Scroll down to the bottom and click the 'Choose default applications by protocol' option.

ENABLE THE HANDY ADMINISTRATOR ACCOUNT

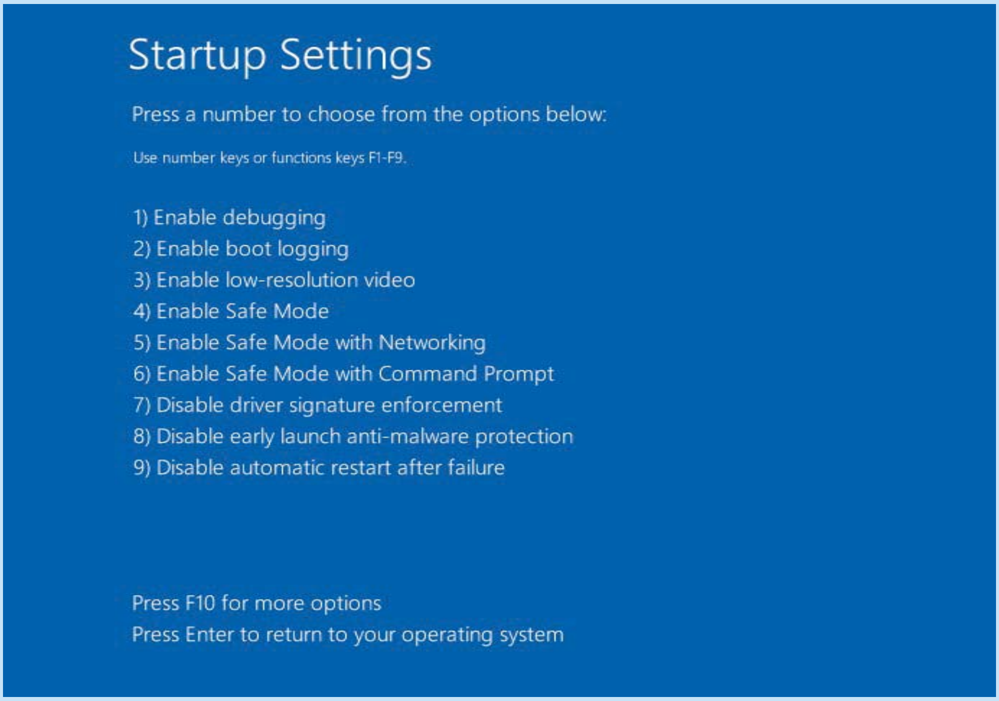
By default, the built-in Administrator account is hidden. To enable it, launch the Command Prompt as Administrator and type **net user administrator /active:yes**. Now, logout to see the newly added Administrator account on the login screen.

CUSTOMIZE AUTOMATIC MAINTENANCE

Launch the Control Panel and head to "System and Security → Action Center." Then, expand the Maintenance section and click on the "Change maintenance settings" link, and use the dropdown menu to select a convenient time.

CREATE A "CLEAR CLIPBOARD" SHORTCUT

To quickly clear your clipboard of unwanted stuff, create a new shortcut on the desktop by right-clicking it, and type **%windir%\System32\cmd.exe /c "echo off | clip"** into the location box. Enter **Clear Clipboard** as the name, and then hit "Finish." ⏻



Startup Settings

Press a number to choose from the options below:

Use number keys or functions keys F1-F9.

1) Enable debugging
2) Enable boot logging
3) Enable low-resolution video
4) Enable Safe Mode
5) Enable Safe Mode with Networking
6) Enable Safe Mode with Command Prompt
7) Disable driver signature enforcement
8) Disable early launch anti-malware protection
9) Disable automatic restart after failure

Press F10 for more options
Press Enter to return to your operating system

START YOUR PC IN SAFE MODE

Hold down the Shift key and click "Restart." In the Advanced Startup screen, go to "Troubleshoot → Advanced options → Startup Settings" and click "Restart." When your computer restarts, you'll see a list of options that includes Safe Mode.

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GAMING
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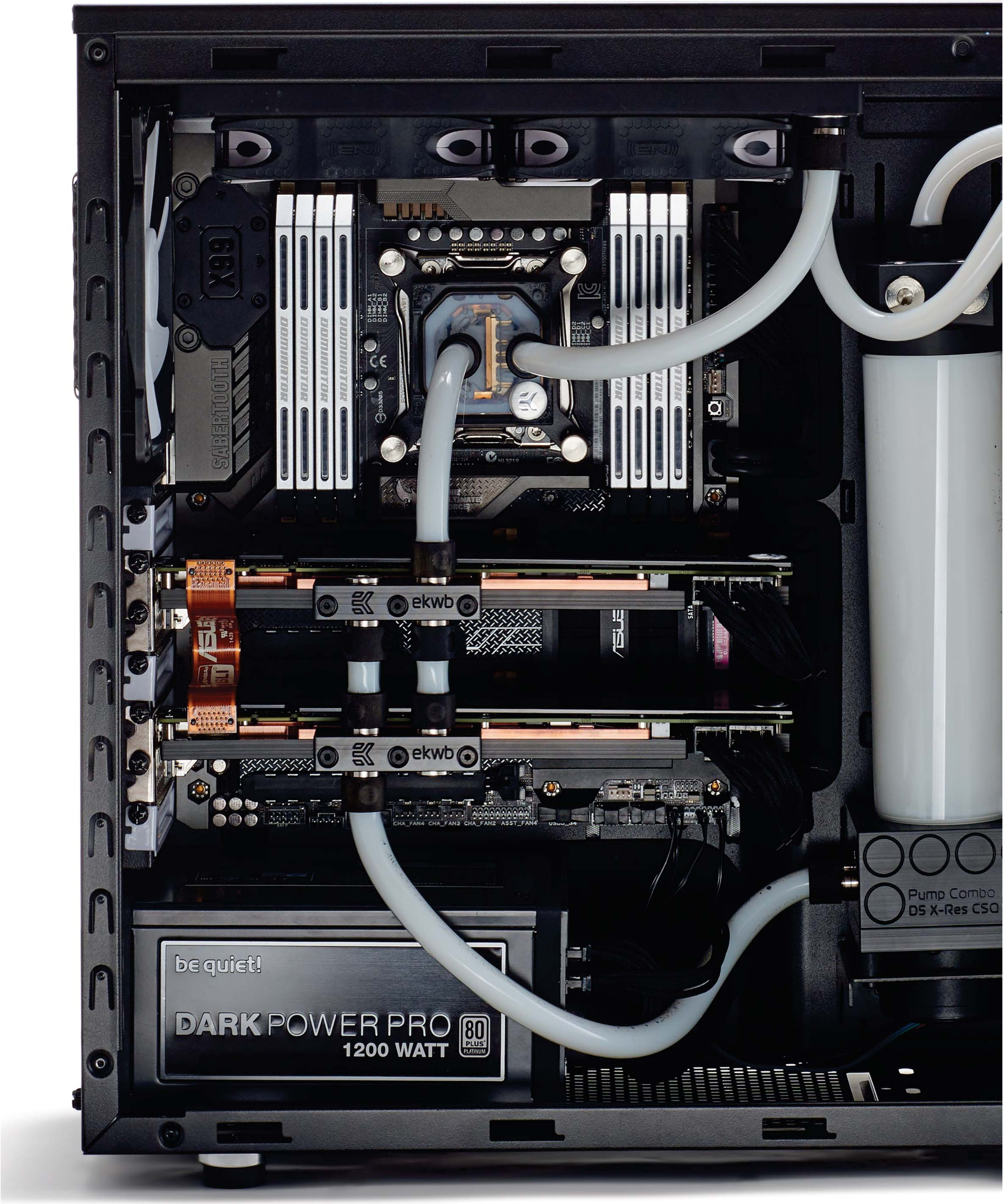
XTREME BUFF. GAME ON.

GEFORCE GTX 950 XTREME GAMING EDITION

GEFORCE GTX 950
GIGABYTE
XTREME GAMING
GEFORCE GTX 950

GV-N950XTREME-2GD

- WINDFORCE 2X with 3D-ACTIVE Fan for silent cooling
- Super Overclock GPU with Gauntlet Sorting Technology
- Factory Overclocked at Base 1203MHz / Boost 1405MHz / Memory clock 7Gbps
- Aerospace-grade PCB Coating for Best Protection
- Titan X-grade Chocks and Capacitors for Extreme Durability
- Multi-color Illuminated LED


X99
SABERTOOTH
DOMINATOR
ekwb
ekwb
ASUS
be quiet!
DARK POWER PRO
1200 WATT
80 PLUS PLATINUM
Pump Combo
DS X-Res CSQ

WATER COOLING 101

Don't overheat—become a water-cooling master

By Zak Storey

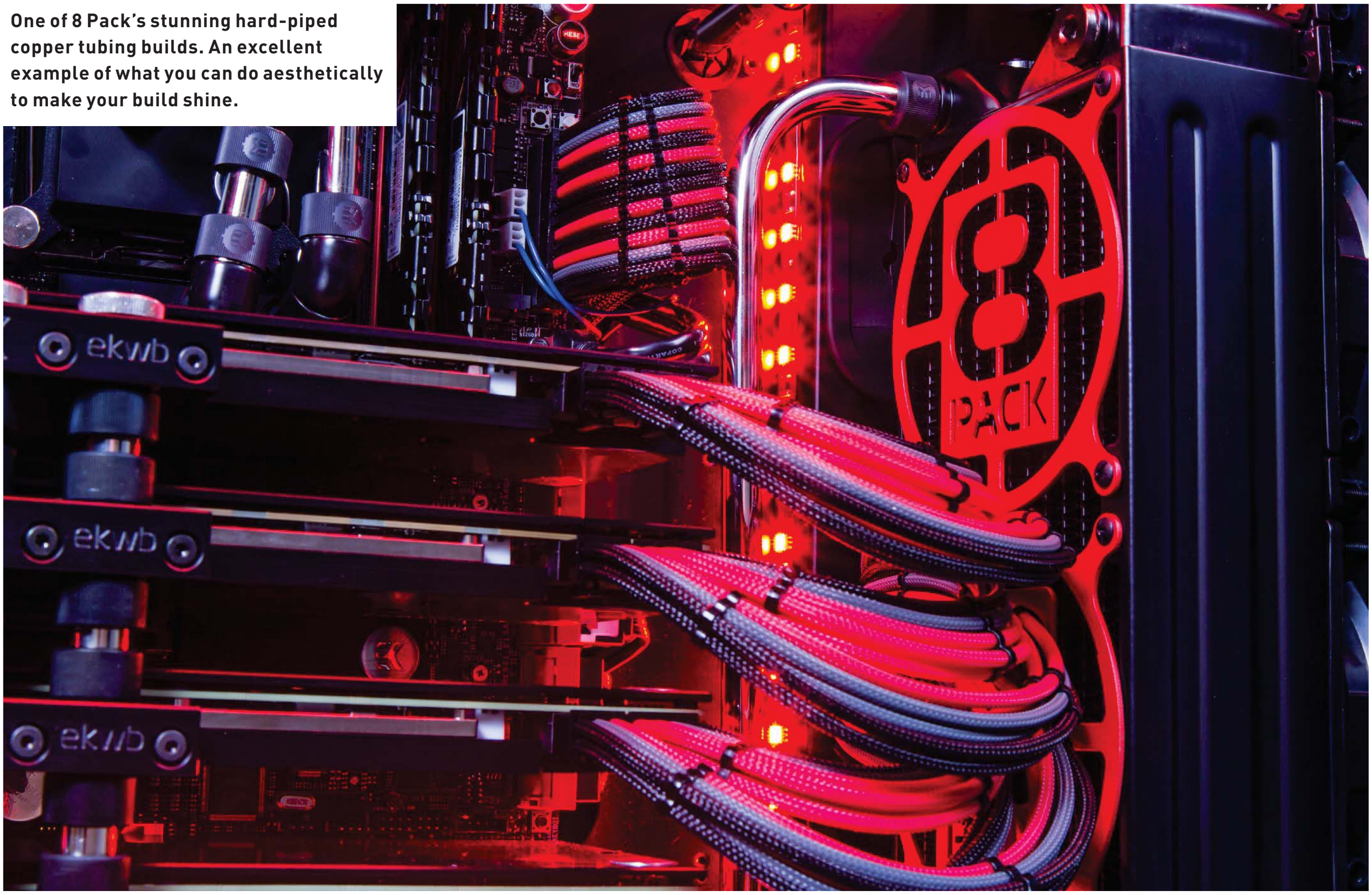
For much of recent history, water cooling has been shunned. Only a select few could afford to merrily dance with computing death, taking their chances with water-cooling hardware and components that weren't even designed to work in the silicon environment. They'd graft plumbing fittings onto hardware and hand-mill various water blocks, all in the hope of creating a leak-proof, watertight system that could efficiently and effectively transfer heat away from their component parts, to a far greater degree than traditional air coolers ever could.

That was back in the times when the average PC enthusiast was less concerned about how a PC looked. More important was how many frames per second they could squeeze from their beige box of dominance in *Unreal Tournament*. It was a terrifying time. But over the last five years, the situation has changed dramatically.

Water-cooling manufacturers and modding companies—such as EKWB, XSPC, Primochill, Bitspower, and E22—have come to the forefront in far greater numbers. This is when water cooling really began to take center stage. Indeed, today you'd be hard-pressed to find a high-end system that's not running some form of all-in-one CPU cooler or a custom loop. Hell, all of us here at the *Maximum PC* office would run hard-piped builds if we could, and there isn't one of us still stuck on the retail cooler, or even an air cooler for that matter.

So, what is it that attracts people to water cooling? Why is it so much better than traditional air cooling? Essentially, all forms of cooling work on the same basic principles. You might have heard of them, they're part of the laws of thermal and fluid dynamics. No matter whether you have an air cooler or a full custom-loop setup, you're transferring heat from one point to the other. It then cools and circulates back around again to transfer that heat out of the system to the outside environment again and again.

All very fancy, right? Air cooling technically isn't an accurate description of that cooling method, and neither is water cooling—they



One of 8 Pack's stunning hard-piped copper tubing builds. An excellent example of what you can do aesthetically to make your build shine.

both essentially require a fan and a radiator to expel that heat. So, is water cooling for you? Should you dive into the murky depths of H_2O nirvana? Maybe you'll discover something about yourself along the way. Read on to find out.

WHY WATER COOL?

Let's cut straight to it. Primarily, water cooling is done to enhance the aesthetic beauty of a build. Don't get us wrong, the heat-reducing properties of multiple radiators and fans cooling your internal components is fantastic and highly efficient. But if you're looking for the most effective price-to-performance ratios, a good AIO cooler for your CPU and a triple-fan GPU cooler would be more than enough to ensure you never hit any of the thermal limits dictated to us by our silicon-inducing overlords. And in today's technological climate, you're far more likely to encounter hardware-based limits, rather than temperature-based ones, in your overclock attempts.

One of the biggest benefits of water cooling, besides looking better than Gabe Newell's monthly bank statements, is the noise reduction. Simply put, noise control is all about effective fan control. It's not necessarily how many fans you have, but how fast they're spinning. Ultimately, the lower the RPM, the lower the noise output. For instance, if you take five 120mm fans and run them at 1,200rpm, and then take two separate 120mm fans and run them at 3,000rpm, we can guarantee the two fans will be creating more audible noise than the five.

AESTHETICS

Water cooling is primarily about enhancing the look of your build, ensuring your silicon shrapnel stands out from the crowd and looks as good as it possibly can. There are multiple ways of doing this with water cooling. By all means, we're not saying that air-cooled builds can't look good—there are some seriously stunning rigs out there that run on simple old air coolers. But water cooling sits at the centre of the modding community. It's responsible for most of the innovations we've seen in this area of the market. Whether that's braided cables, windowed-side panels, or LED lighting, you can assume that the vast majority of these ideas originated from some modder out there grafting an idea onto one of their builds, and then showing it off to the masses.

So, you have four options in total when it comes to liquefying your machine. First, you could simply just use an all-in-one cooler. This way, you avoid the hassle of setting up any kind of crazy system, you're covered by a warranty, and still gain the benefits of having a water-cooled CPU. Your second option is to go with a soft tubing loop, utilizing flexible colored or clear tubing. This is one of the most adaptable water-cooling methods as the tubing is flexible and easy to use.

The third and currently most popular option is to use acrylic tubing, most notably PETG tubing. This non-fragile, highly robust hard piping creates an entirely different look for a build, utilizing straight lines and angles to really make your rig pop. And then, finally, there's copper tubing. It's identical in almost every way to acrylic tubing, except it's far easier to bend and a lot cheaper. Copper provides a good base to either nickel or chrome plate or even powder coat as well, though it's opaque. Whichever way you choose, you'll still benefit from the reduced noise and the far-superior cooling capacity that water cooling provides.

WATER-COOLING COMPONENTS

If you thought that building a custom PC was tricky enough, then we've got some bad news for you. Here's a quick rundown of what you'll have to consider purchasing on top of your standard build. You'll

EK's Supremacy Evo CPU block provides incredible cooling with a simple mounting mechanism. We went transparent to show off our snazzy white pastel coolant.

need: a case, tubing, radiator(s), a CPU block, GPU block(s), GPU backplate(s), memory block(s), reservoir(s), pump(s), compression fittings, angled fittings, bulkhead fittings, stop valves, coolant, and fans. Once you've decided how you want to cool your rig and what chassis you want to cool your build in, then it's a simple matter of pricing your choices, throwing it all in the basket, and breaking your wallet in two as you fork out for an expensive exercise in modding.

CPU BLOCK

By far the most obvious component to cool your rig. You'll need to make sure you buy a CPU block that's compatible with the chip you're trying to cool. More often than not, this is just a simple choice between Intel and AMD, as processor sizes don't tend to vary greatly.

GPU BLOCK

Predictably, GPUs experience the greatest deal of variance. Both in the design of the PCB and in which graphics processor you choose as well. You'll need to make sure you buy a compatible block for your card. Some manufacturers, such as EKWB, will often include specific water blocks designed to work with aftermarket cards such as Gigabyte's Windforce, MSI's Lightning, or the Asus STRIX series of cards. This may extend as far as the backplate as well, so always double check.

MEMORY BLOCK

Whether or not you decide to cool the RAM with your custom loop is entirely up to you. The modules certainly do output heat. But really, it just looks more awesome than anything else. Besides, nobody will penalize you if all you're looking for is to cool your CPU and GPU. You'll also need compatible RAM modules that match up with your water blocks.

DISPELLING THE MYTHS

MANY FICTIONS CLOUD THE WORLD OF WATER COOLING, SO WE'VE SIFTED THE REALITY FROM THE RUMOR

MYTH 1

If I use deionized water in my loop, then leaks won't matter or cause any damage.

Answer Unfortunately, no. As soon as the water is introduced to the system, it will begin making contact with the various metals inside of the water blocks. It will soon be picking up positive ions, meaning it'll be conductive within a couple of hours, at the very least.

MYTH 2

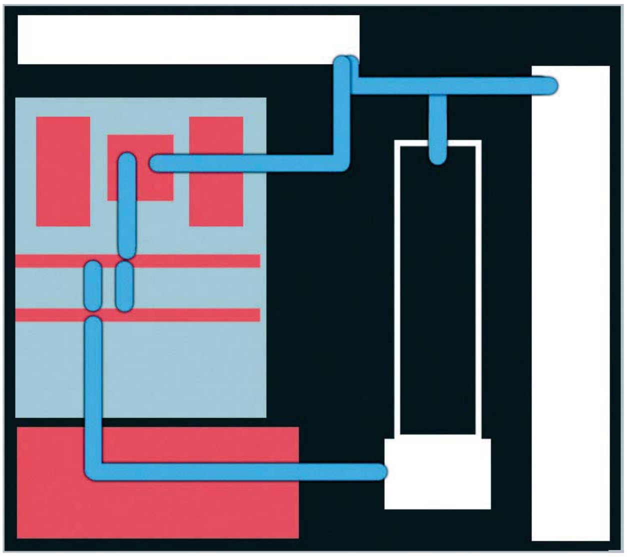
What If I blow it up when I switch it on? What if there's an instant leak?

Answer Honestly, you're not going to damage anything. The best way to fill and test a loop is to make sure everything's unpowered by using a PSU bridge. By using this bridge, you can switch on just the pump and that's it. Leave this on for 24–48 hours to see if you have any leaks.

MYTH 3

If I water cool my PC and add more fans, it's going to cool down my room right?

Answer Definitely not. In fact, it's more than likely that the opposite will occur. Your hardware may run cooler, but you'll still be outputting the same amount of heat (or maybe even more if you're ramping up that overclock), out of the same radiators. If anything, your room will become warmer as you'll have more fans pushing more heat out of those radiators.



Even if it's just a shoddy Photoshop design, planning your build visually will save you time when it comes to figuring out how many fittings you're going to need and how best to run your cooling loops.

Making sure you've got enough space to work inside of your chassis is vital for having a stress-free, easy build.

FITTINGS

Some of the most important parts of your build are the fittings you choose to use. Depending on what tubing you decide to use, you'll need either compression fittings or acrylic fittings. Although acrylic fittings are still technically compression fittings, they're designed to work around hard tubing by not crushing the acrylic as much, unlike traditional compression fittings, which tend to have a greater pinch to them. If you're looking for a basic build, you can usually get away with just the standard fittings.

However, if you're looking at designing a build with cleaner lines and a little more flare, you may want to invest in some angled fittings as well, usually stipulated at 45 or 90 degrees. Additionally, a stop valve might come in handy for loop maintenance.

PUMP / RESERVOIRS

Technically, you don't need to buy a reservoir to successfully run a water-cooled loop. However, they do look rather impressive, and make it a lot easier to fill a water-cooled system than using other methods. You will, however, always need a pump to ensure that the fluid within your system is flowing, and pulling heat away from your core components and out to the radiators. Additionally, you should always have your pump gravity fed (meaning fluid should always be flowing down into it).

RADIATORS AND STATIC PRESSURE

At this point, you need to look at how you're going to output that heat. The only option you have is to use radiators. You can do this however you like, either by using separate loops for your GPUs and CPUs or by combining the two together into one single loop. But you'll still need radiators to get rid of all of that heat, and accompanying fans to reduce this per loop.

Once you've decided what space your case has for radiators and how many you're going to use, you need to take a closer look at the FPI and thickness of the radiators you'll be using. FPI stands for fins per inch. Essentially, the higher the FPI, the higher the static pressure you're going to need to effectively move cool air through that radiator. For instance, if you have a radiator with an FPI of 38, you'll probably want static pressure optimised fans. However, if you have deeper radiators with a lower FPI of 16, you won't see any comparable difference between static pressure fans or airflow fans. In fact, in these cases, you're often better off equipping them with airflow fans instead.

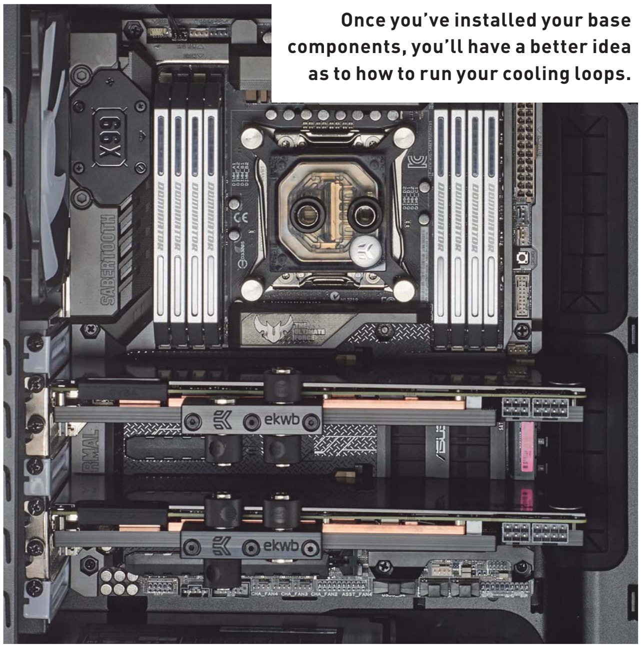
WHERE TO BUY?

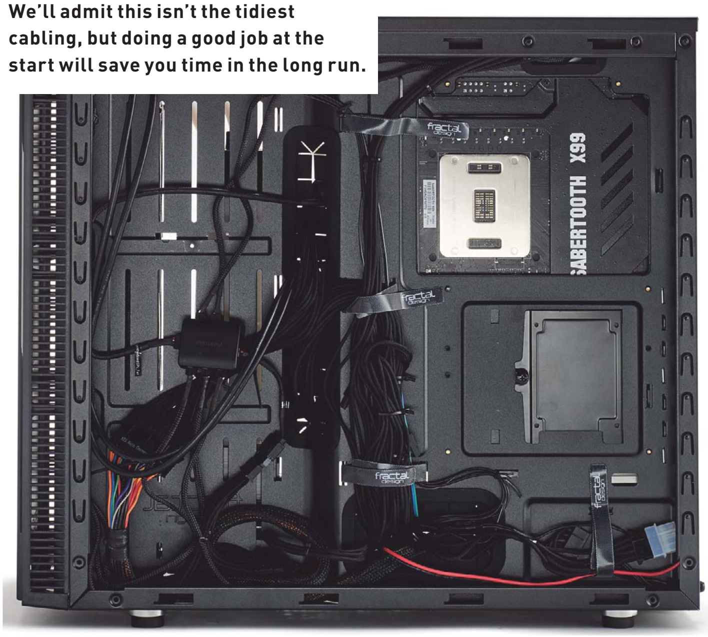
There isn't a fantastic array of places where you can buy a lot of these components in the United States. But one of the largest water-cooling specialists in the country is Frozen CPU (www.frozencpu.com), which has a vast selection. Additionally, if you're a little more patient and want to ensure you're getting EKWB directly from the source, you can buy straight from EKWB's site (www.ekwb.com). Also, here's a special shout out for EKWB, without whom there simply wouldn't have been any way to provide this first look into water-cooling for y'all.

PLANNING YOUR LOOP

So, at this point, you should be well aware of all the hardware you'll need to consider. Next, you want to research which case is best. There's a huge variety out there. In fact, you'll find there are water-cooling cases from Mini-ITX chassis all the way up to full E-ATX super towers. Once you've found your case, check what radiators it can support for water cooling. Then you need to think about your tubing and how you're going to cool it—a single loop or dual loops. Once you have all these decisions nailed down, your best bet is to sketch out how you want to run your loop, and how many fittings you'll need for all your hardware. Usually, you'll need two fittings per water cooling item—one in and one out.

For us, the choice was pretty simple. We'd use the Fractal Define S, a case designed from the ground up for easy water-cooling installation. A dual radiator at the top and a triple rad at the front. On


Once you've installed your base components, you'll have a better idea as to how to run your cooling loops.


We'll admit this isn't the tidiest cabling, but doing a good job at the start will save you time in the long run.

top of this, we'd be using a single closed loop to cool both of the EVGA Superclocked GTX 980 Ti cards and the Intel Core i7-5820K. Then it was a matter of tallying up how many fittings we needed, taking into account we'd be using soft tubing and a pump/res combo, as well as planning how our build would look. We'd be using an Asus X99 Sabertooth TUF mobo—stunningly gorgeous and covered in black-and-grey-plated armor. On top of this, we managed to get hold of a mixture of black water blocks and fittings. We'd use white coolant to add a little contrast.

CHOOSING THE CHASSIS

Picking the right case can be a tricky business, especially when you're looking to do a water-cooled mod such as this. The best way to do this is to look out for cases designed particularly for water cooling, or by companies who revolve around it. Parvum, Phanteks, Corsair, Caselabs, and Fractal are all fantastic case firms that provide some excellent chassis to work and build in, making it easy to create a stunning work of art.

Selecting the right case is undoubtedly the biggest consideration you have to make. It will dictate where your reservoir goes, how many radiators fit and what thickness they are, plus how your tubing runs will work. For instance, we tried to build this particular setup inside the Phanteks Enthoo Evolv, but we'd already pre-ordered the water-cooling components for a different chassis and they ended up being incompatible with the Phanteks, even though that's a huge case to work in.

FITTINGS AND LOOPS

And so begins the building process. Of course, like with our regular builds, we advise that you build all your PCs outside of the case first, just to see if they work. We individually tested both our GPUs, the memory, and the CPU with traditional coolers, before throwing water blocks on any of it.

Then we began the internal build process, stripping the chassis of any unwanted components, such as hard drive bays and cages, and continued to install the motherboard, the memory, and the GPUs, securing them firmly to ensure that nothing would fall out or become damaged over the course of our build. We also took this opportunity to install the radiators and plug in the fans where they were necessary. It's also time to attach the reservoir, and install all of the fittings.

CABLE MANAGEMENT

In a build like this, cable management needs to be flawless. The last thing you want is excess, untidy cables cluttering up your rig. Not only will they get in the way of the tubing, they'll also restrict airflow and generally make your tubing routes that little bit more difficult. Cablemod (www.cablemod.com) provides custom-sleeved cables for Be Quiet!, Cooler Master, Corsair, EVGA, and Seasonic power supplies. These should spruce up your build quite nicely. Alternatively, it's not impossible to sleeve the cables yourself. This takes a lot more time and patience, but you can include cable combs to keep the cables tidy, plus vary your color schemes.

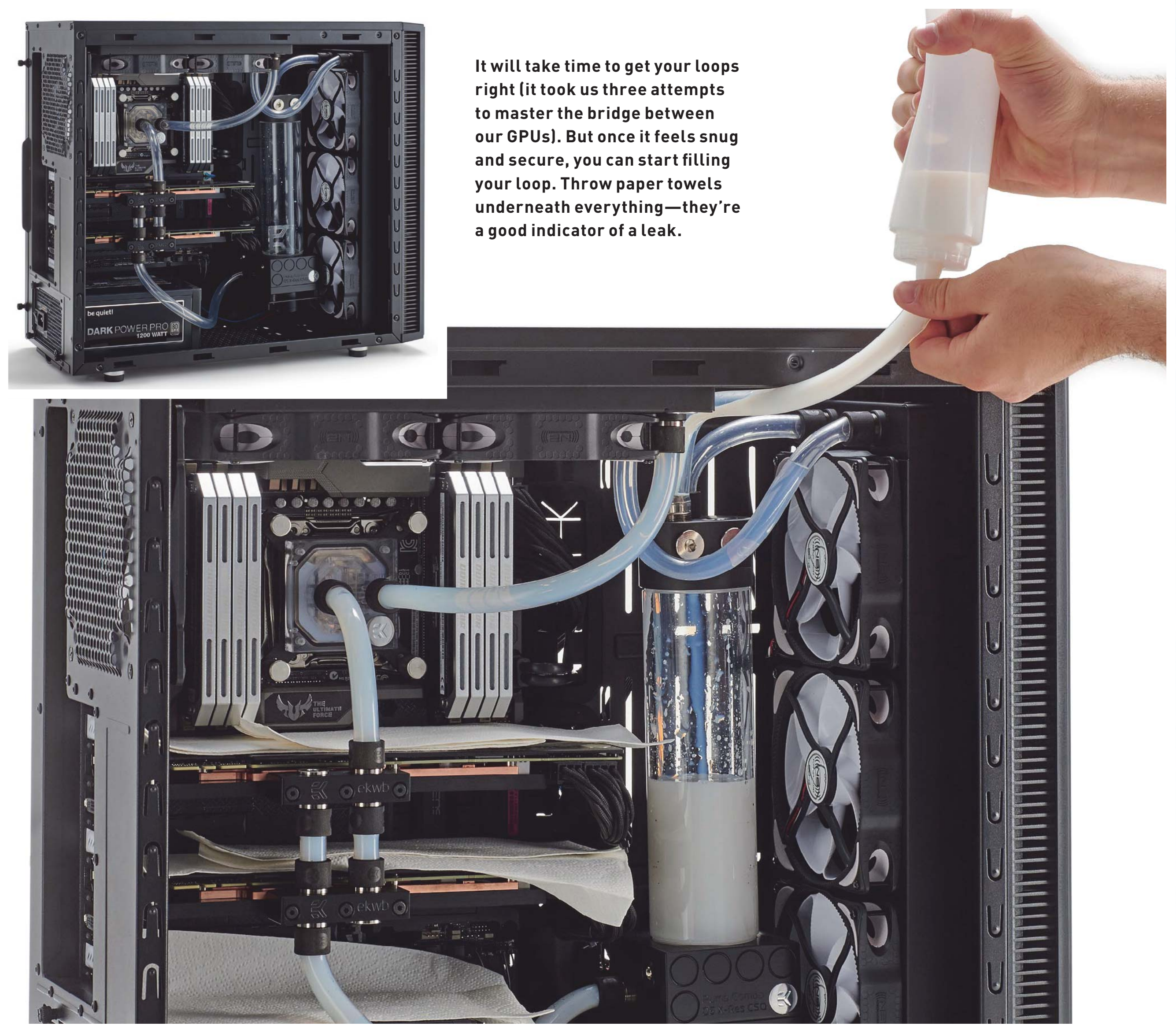
Additionally, we used the Phanteks PWM Fan Hub. Threading all five Noiseblocker fans through one fan controller means we can control how much power they receive directly from the CPU fan header, meaning the system will ramp up or down dependent on CPU temperature (which, admittedly, will be quite low for this build).

BUILDING AND PRIMING THE LOOP

At this point, it's time to start your tubing runs. Line up a stretch of tubing between the two points you wish to connect, then cut a little more off than you think you'll need. It's better to have too much than too little—you can always shorten the runs later. Next, unscrew one of the fittings, wiggle your tubing onto the fitting, and thread the other end of the compression fitting onto the unattached end. Then screw it down, compressing the tubing in place.

If you're struggling to fit the tubing on, use a pair of needle-nosed pliers. Gently insert them into the end of the tubing and carefully stretch the tubing slightly, so it's easier to work. Then you'll need to take the sleeve off the other fitting, pre-attach that to your new tube and do the same with the other end. It's then simply a case of running all of the tubes to their correct lines. It doesn't matter which tube goes where, as long as it creates a loop. Once the system is sealed off and pressurised, the temperature of the water will be consistent around the entirety of the loop, regardless of which component goes to which first. Thanks, physics!

You're now at the scary part—priming your loop. Ensuring that the reservoir is gravity feeding the pump (in other words, it's above), attach one last fitting with a length of tubing onto the top of the reservoir (depending on how you have your reservoir set up, it might



It will take time to get your loops right (it took us three attempts to master the bridge between our GPUs). But once it feels snug and secure, you can start filling your loop. Throw paper towels underneath everything—they're a good indicator of a leak.

be advisable to get a multi-port top adapter). Then use a funnel to carefully pour your coolant into the loop. In our case, we like to use a plastic ketchup bottle to fill our loop.

Before doing any of this, you want to make sure that everything on your motherboard is unpowered. Ensure that your CPU power, your motherboard ATX power, and any power cables heading to your graphics card are all unplugged, either at the power supply end or the hardware's end. Then you'll want to either bridge the two power points on the ATX power with a paper clip, or use a specially designed bridge connector. Then it's simply a case of switching the power on every time you fill the reservoir, until the entire loop is filled. Just remember not to do this until after your reservoir/pump has fluid inside of it.

CONCLUSION

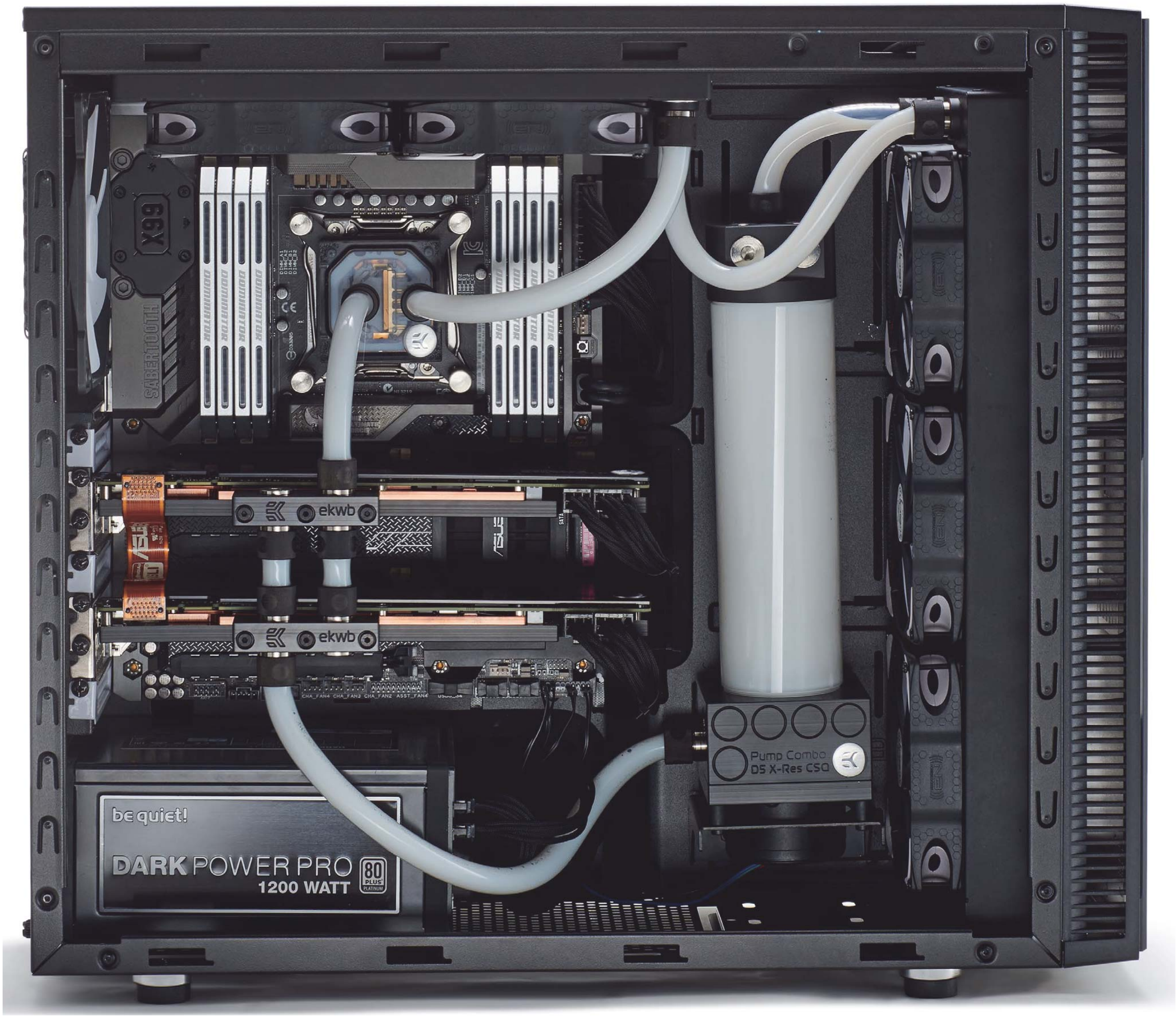
As you've probably already spotted, the build looks great. Matching the black EK water blocks with the Asus X99 TUF Sabertooth worked out really well, and the white provides a brilliant contrast to the overall style and look.

The temperatures are where we expected them to be. We clocked the Core i7-5820K up to 4.4GHz and recorded temperatures at 55 degrees Celsius under load. The GPUs remained at around 60 degrees under full load and we maintained the fans at a constant 20 percent speed throughout the system.

As for performance, we couldn't really get much more out of either the GPUs or the CPU, as they were already at their hardware limits. But either way, the performance was still outstanding, and the fact that it remained so quiet even while under high load is really something else.

A worthy mention here is definitely the coolant. We used EK White Pastel coolant to fill our loop and it looks fantastic, even with a soft tubing loop. Our leak test went without a hitch. Although we could only test it for around 45 minutes during the shoot, there was absolutely no spillage. The EK compression fittings ensured an incredibly tight seal around all of the components. That is, as long as you haven't damaged the tubing in the process (especially if you're lazy like us and use scissors). Generally speaking, you should always run a leak test for 24 hours minimum before powering any of the components on, but in our case, we simply didn't have time.

In hindsight, we'd have loved to have gone with hard tubing. It's all the rage at the moment, and rightly so—it's some of the nicest-looking water-cooled work you can do. A larger case would have also been good. One of Caselabs's Magnum SM8s or Parvum's ATX chassis would've been excellent—going up to two 360mm radiators



instead of just the one and a dual radiator would have been great for additional cooling.

A different chip would have also been nice, just to see if we could push beyond the silicon limits on ours. Thermally, there's no issue with our 5820K, it just won't clock beyond 4.4GHz, but that could have been a different story if we'd gone beyond the 4.7GHz boundary. Additionally, running two loops would've looked stunning. One in black and one in white, separating the GPU and the CPU.

Should *you* be water cooling, though? That was the original question. It depends on your budget. As with any build, hard cash is ultimately what it always comes down to. If you're looking for the best bang for your buck, water cooling with a custom loop just isn't for you. Even if you do it on the relative cheap, you'll still be looking at somewhere around the region of $600, minimum, on top of everything else.

Water cooling is for those looking to build a beautiful and quiet workstation capable of destroying benchmarks and running any task you can throw at it with absolute silent ease. It's not for the faint hearted, and although water cooling has come a long way since the first attempts way back yonder, it's still filled with danger and possible hardware failure. But then, we don't know of any aspect of the PC enthusiast's arsenal that isn't. ⏻

SPECIFICATIONS

CPU	Intel Core i7-5820K @ 4.4GHz
Motherboard	Asus Sabertooth X99
Memory	64GB Corsair Dominator Platinum (8x 8GB) @ 2,666MHz
Graphics	2x EVGA GeForce GTX 980 Ti Superclocked ACX 2.0+
Storage	2x Samsung 850 EVO 500GB SSD
Case	Fractal Define S
Power supply	Be Quiet Dark Power Pro 11 1,200W – Platinum
Fans	5x Noise Blocker NB-eloop B12-2 120mm fans

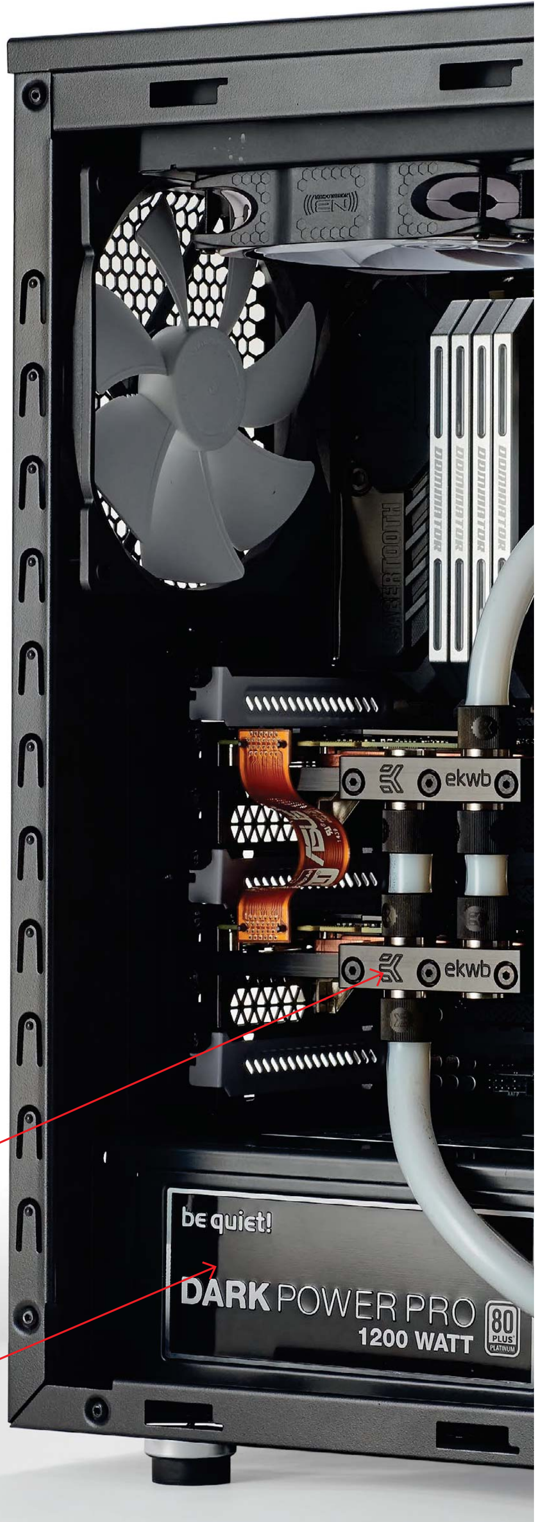
TECH PORN

PERFORMANCE GEAR LAID BARE

Maximum PC's Water-Cooled Gaming Rig

WE ARE PC GAMERS, and PC gamers demand the best that their pay check can muster. Well, no. Sort of. It's usually whatever money we have left over after our other activities—but you get the point. For the enthusiasts among us, the first step is to get hold of an all-in-one cooler. Then maybe some braided cables and LEDs. Then, finally, jump into the murky depths of water cooling.

That's exactly what we did here, and damn, does it look good. We used an Asus X99 Sabertooth, an Intel Core i7-5820K, 64GB of Corsair Dominator Platinum RAM, and two EVGA GTX 980 Ti cards to produce one number-crunching, super-benchmarking machine. And boy, does it perform! Fancy 4K gaming at ultra 60fps? No worries. The biggest problem we had was deciding whether we wanted a 1440p, 144Hz monitor or a 4K, 60Hz one. Anyway, enough words, enjoy! –ZAK STOREY



1 Graphics card bridge

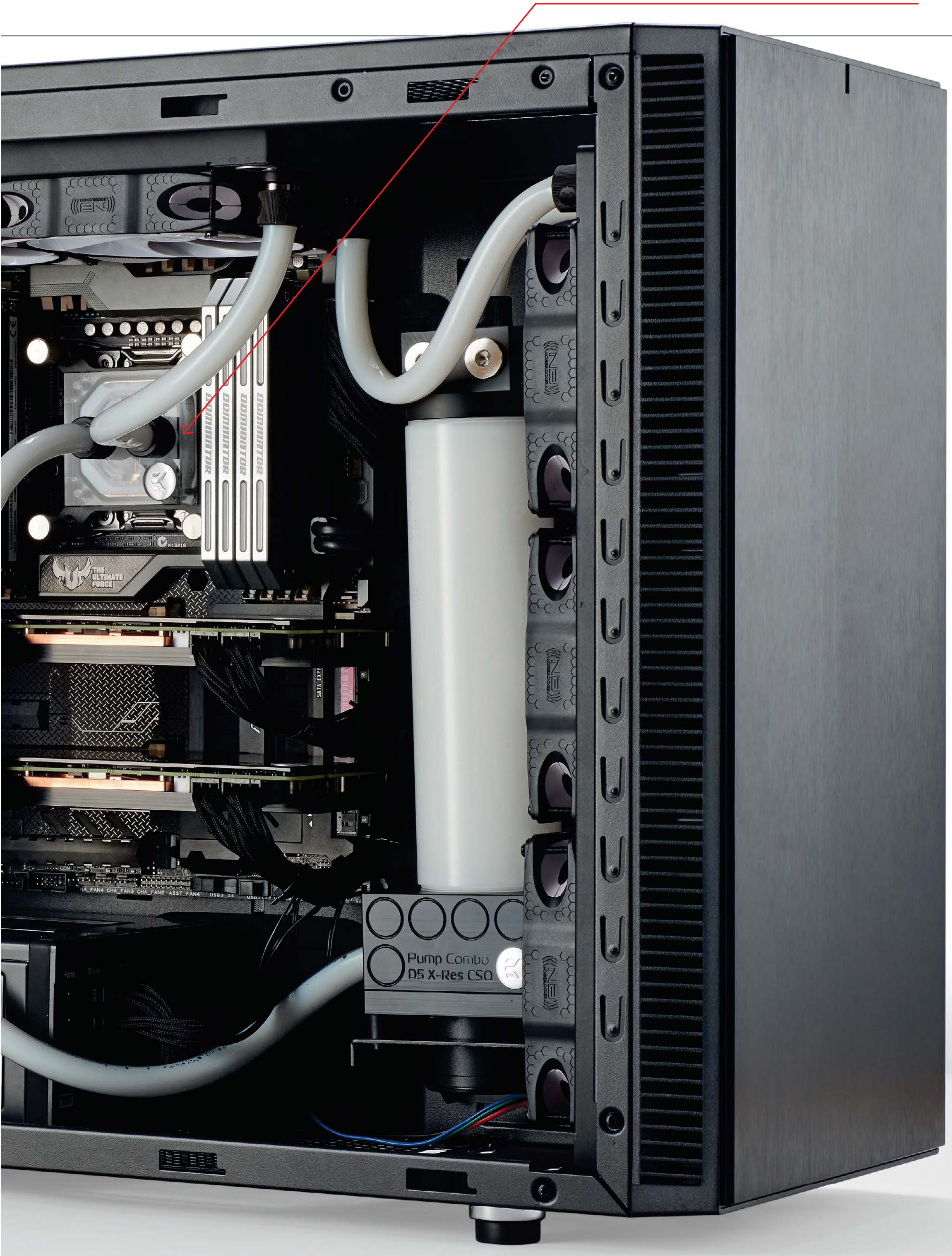
Probably the hardest part of this build was fitting tubing between the graphics cards. You can get plexi block covers, but we opted to use tubing instead. Wobbling two $600 cards onto one another to get this to fit was a little terrifying.

3 Power supply woes

Speaking of popping, this was actually the second power supply we used for this build. Although it's been running as our daily PSU for the last three months, for some unknown reason, it gave up the ghost just as we'd finishing shooting the photos.

2 Plexi CPU block

We've already mentioned the monster that is the 4.4GHz Intel Core i7 running at the heart of this build, yet the block is probably the definitive focal point. We'd have loved to have slammed some single LEDs under this, just to make it pop.


DOMINATOR
DOMINATOR
DOMINATOR
THE ULTIMATE FORCE
SATA EXP
Pump Combo
D5 X-Res CSO

THE 20 BEST FREE GAMES

Right now, on PC, at least...

By Daniel Griliopoulos

Plenty of F2P games fall into the camp of huge time sinks, where players can get a second-rate experience very slowly, or pay extra to get a first-rate experience with less time. Time is the killer here, so we've selected our favorite F2P games that you'll never need to pay for. (Unless you want to thank the heroic developers who make these things with no guarantee of any reward.)

The games on the next few pages are as good as any paid game, though it's a lot harder to give them away for Christmas. We've tried to pick out a wide selection, so there's something for everyone—from *The Cat and the Coup*, for the political amongst you, to *Dota 2*, for those of who you don't like to sleep.

It's worth saying that we've had to leave out an awful lot of great games. Most sad was the number of indie games we've not been able to cover. Sites such as Warpdoor (www.warpdoor.com) and IndieGames (www.indiegames.com) are your best bet to find these on a daily basis.

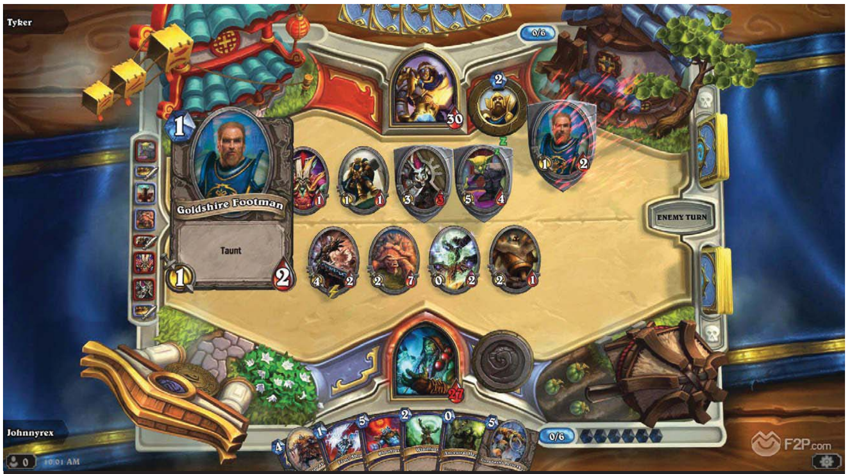
And to mention just a few others... *Double Hitler*, *Star Wars: The Old Republic*, *The Battle of Wesnoth*, *War Thunder*, *League of Legends*, *World of Guns*, *Flow*, *Humanoid 47*, *Kingdom of Loathing*, *A Dark Room*, *Fallen London*, *Where is My Beard*, *No One Has to Die*, *Neverwinter*, *Smite*, *Hawken*, *Wolfenstein 3D*, *Tyrian*, *Realm of the Mad God*....

Dota 2

There's no denying the popularity of Valve's team arena game. At the time of writing, 16 teams are competing for a prize pot of over $18million, with much of that money coming from the game's community. The game itself has you taking control of one unique character alongside four others, playing against another team of five in a RTS map. You need to level up and take down the enemy's towers and fortress, while preventing them destroying yours. Very impressive for a game that started as a simple mod to *Warcraft III*.
http://blog.dota2.com

Heroes of the Storm

It seems crazy to have two multiplayer online battle arenas, or MOBAs, in here. And especially crazy to leave out *League of Legends*, considering it's even bigger than *Dota*. But *LoL* is older than *Dota*, and features almost identical gameplay to an outsider. By comparison, *Heroes of the Storm* is much more accessible; not unexpected given that it's from Blizzard itself. Players take control of a hero from the *Starcraft*, *Warcraft*, and *Diablo* universes, with a much larger variety of maps compared to *DOTA* and *LoL*.
http://eu.battle.net/heroes/en/



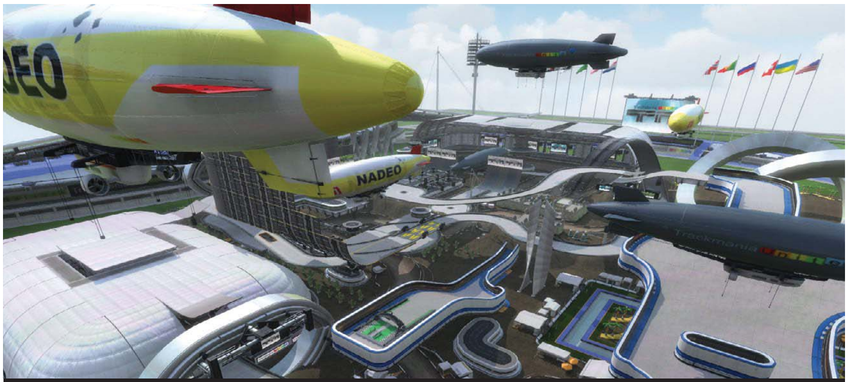
Hearthstone

Another Blizzard title, this game signifies a change in the *World of Warcraft* dev's style. Instead of games that cost the GDP of a small country to rake in tons of money, it's doing it with free games. *Hearthstone* is a Collectible Card Game with single-player and story modes. It's competitive, but also rewards casual players. http://bit.ly/1F2zqJn

World of Tanks

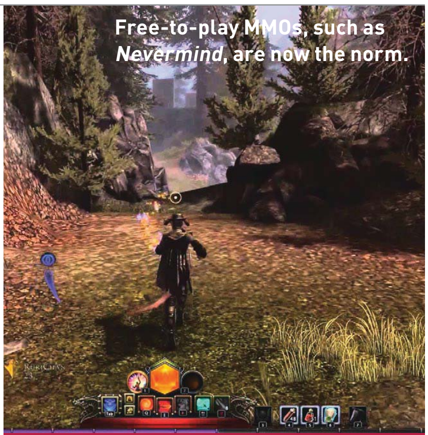
Developer Wargaming.net now employs several thousand people across 16 countries, and it's all down to the surprising success of *World of Tanks* (and its sister titles *World of Warplanes* and the forthcoming *World of Warships*). *WoT* is the one that's paid for all those staff though, and that's because it's like a very slow FPS. Players take control of a range of historical tanks in PvP battles and attempt to either destroy the other team or capture bases. http://worldoftanks.com

WARGAMING.NET



Trackmania Nations Forever

Few game developers know how to bottle joy. It takes a combination of special things—bright, clear art, simple mechanics, and endless replayability. *Super Mario Sunshine* has it, and so does the PC-only stunt-racer *Trackmania*. It also lets you create your own tracks, try them out, share them, and challenge your friends. *Forever* isn't the newest version of *Trackmania*, but it combines the best earlier versions of the game—*Trackmania Original*, *Sunrise*, and *Nations*—which means it has huge amounts of content. http://trackmaniaforever.com



Free-to-play MMOs, such as *Nevermind*, are now the norm.

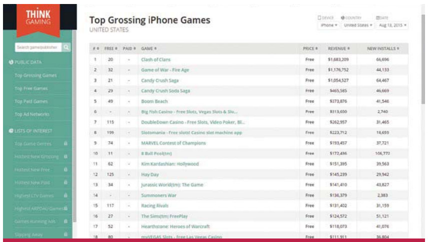
The Death of MMOs

THE FREE GAMES revolution opened up all sorts of genres that seemed stagnant or extinct—puzzle adventure games have been revived by the hidden object game, and platformers by the flash platform—but it's slowly spelled the death knell for paid-for massively multiplayer online games, or MMOs.

"Free-to-play, it's the better business model," Mike Donatelli told us. He's from Carbine Studios, creator of *Wildstar*. "Fact. There are no barriers to entry. Pick a forum, any forum, go there and there'll be people saying, 'I like the game, I'm just not paying you any money for it.' And that's *every* post... we absolutely acknowledge that the MMO community has evolved past the [subscription] business model."

It's also interesting that investing huge sums of money into creating these MMOs seems less attractive, as revealed by Blizzard's Mike Morhaime, when the dev's *World of Warcraft* follow-up *Titan* was recently cancelled. "We didn't find the fun," he said. "We didn't find the passion. We talked about how we put it through a reevaluation period, and actually, what we reevaluated is whether that's the game we really wanted to be making. The answer is no." The games that it seems to want to be making are *Hearthstone* and *Heroes of the Storm*—both free, small, multiplayer, skill-based games with strictly limited ambition. So *Titan* was turned into a small, skill-based multiplayer shooter called *Overwatch*.

Of those MMOs that were subscription-based, such as *Wildstar*, very few are still so. *Star Wars: The Old Republic*, *Rift*, *Dungeons & Dragons Online*, *Neverwinter*, *Star Trek Online*, *The Elder Scrolls Online*... they've all changed their stripes, cancelling the subscription charges and quite often the up-front purchase cost as well, instead charging for in-game fripperies.



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- Slipping Away

Top Grossing iPhone Games
UNITED STATES

DEVICE: iPhone ▾ COUNTRY: United States ▾ DATE: Aug 13, 2015 ▾

#	FREE	PAID	GAME	PRICE	REVENUE	NEW INSTALLS
1	20	-	Clash of Clans	Free	$1,683,209	66,696
2	32	-	Game of War - Fire Age	Free	$1,176,752	44,133
3	21	-	Candy Crush Saga	Free	$1,054,527	64,467
4	29	-	Candy Crush Soda Saga	Free	$465,585	46,669
5	49	-	Boom Beach	Free	$373,876	41,546
6	-	-	Big Fish Casino - Free Slots, Vegas Slots & Slo...	Free	$313,650	2,740
7	115	-	DoubleDown Casino - Free Slots, Video Poker, Bl...	Free	$262,957	31,465
8	199	-	Slotomania - Free slots! Casino slot machine app	Free	$223,712	14,659
9	74	-	MARVEL Contest of Champions	Free	$193,457	37,721
10	11	-	8 Ball Pool(tm)	Free	$172,436	106,772
11	62	-	Kim Kardashian: Hollywood	Free	$151,395	39,563
12	125	-	Hay Day	Free	$145,239	29,942
13	34	-	Jurassic World(tm): The Game	Free	$141,410	43,827
14	-	-	Summoners War	Free	$136,379	2,383
15	117	-	Racing Rivals	Free	$131,402	31,159
16	27	-	The Sims(tm) FreePlay	Free	$124,572	51,121
17	52	-	Hearthstone: Heroes of Warcraft	Free	$118,073	41,076
18	80	-	myVEGAS Slots - Free Las Vegas Casino	Free	$111,911	36,804

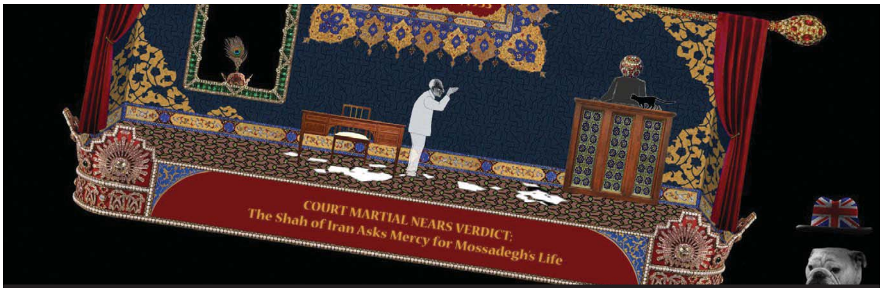
Lessons from Mobile Gaming

FREE GAMING MAY have started on PC with the likes of *Wolfenstein 3D*, but mobile games are its home. Take a squint at the image above—that's the top 50 highest grossing games on iOS on a particular day in August this year. The highest ranked paid-for game was *Minecraft: Pocket Edition* ($6.99) at number 24, followed by *Five Nights at Freddy's* at 39. Apart from that, every other game was free and making huge amounts of money. *Clash of Clans* made $1.6 million in a week. In a week!

This is partly a result of the ease of microtransactions on mobile devices. Players can buy an in-game item for a miniscule sum of money without leaving the app or hunting down their credit card information.

It's also because these developers are obsessed with money. These aren't hipster indie programmers keen to demonstrate their credentials and make a critical success. If you attend one of the mobile game conferences, the talk is all about monetization, and has been for years. How to make money more efficiently? How to game the various in-game advertising systems? How to artificially bump yourself up the charts and get Apple's attention? Every year, Apple bans another method of making money from mobile games, like some financial regulator dealing with untrustworthy banks.

But it's mostly the result of market saturation. There are so many games released every day—so many good ones and so many knock-offs—that the effect has been to push the price to zero. Why buy *Angry Birds* for $3 when you can get the functionally identical *Ornery Avians* for free? It's a constant worry for PC game developers that the price of all games will be driven down to zero. Thankfully, the PC market still seems happy to pay console prices for games at launch, perhaps because of the cost of buying or building your own gaming PC.

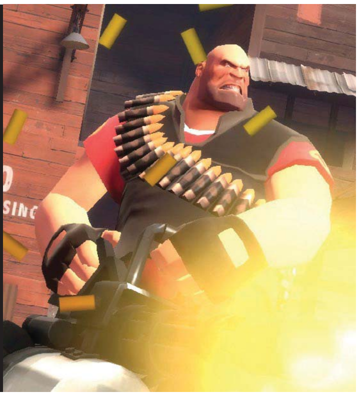

COURT MARTIAL NEARS VERDICT:
The Shah of Iran Asks Mercy for Mossadegh's Life

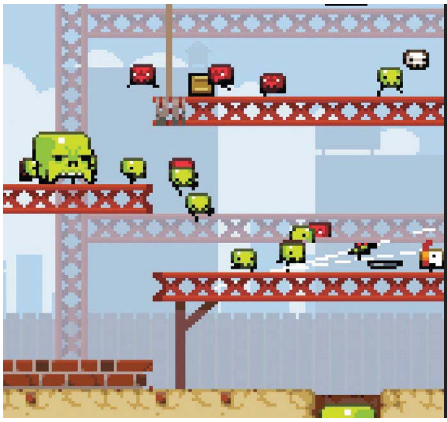
The Cat and the Coup

There are many free indie games, but few with a message as moral as *The Cat and the Coup*. Players control the president of Iran's cat during the CIA / MI6-engineered coup that brought down the democratically elected government, and led eventually to the current Islamic state. You use the cat to solve puzzles and move the president. It's as much interactive art and history lesson as it is a game.
www.thecatandthecoup.com

Team Fortress 2

Though *Team Fortress 2* has fallen out of favour in recent years, it was the game that revolutionised free-to-play gaming. Players compete in two teams of cartoon movie caricatures – from the minigun-toting Heavy to the Germanic-accented Medic – to capture bases or simply kill as many of each other as possible. A range of game mode additions, AI bots, custom maps, and a range of weapons—randomly dropped and bought—have given the game a huge amount of replayability.
www.teamfortress.com





Super Crate Box

Vlambeer is the current darling of indie development, with its cofounder Rami Ismail acting as a strong voice of toleration and creativity for developers everywhere. *Super Crate Box* resembles the original Game and Watch Nintendo machines, where enemies fall from the top of the screen and crates full of weapons spawn randomly. If you like this, try Vlambeer's other games, such as *Luftrausers* or *Nuclear Throne*.
http://bit.ly/1I7MVad

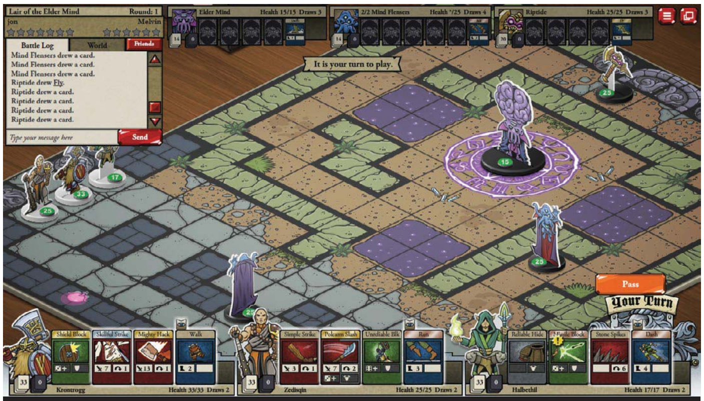
Path of Exile

Though *Diablo 2* is widely acknowledged as the king of the action RPG genre, and *Diablo 3* is the prettiest example of the genre (save for maybe *Torchlight 2*), these are paid-for games. By contrast, *Path of Exile* is neither particularly beautiful nor as crunchy as *Diablo 2*, but it is free and extremely well-made and compelling. It's the kind of game where you kill thousands of enemies in your lust for loot—and maybe to move the story on. It has a range of game modes (called "leagues"), which change regularly. Oh, and it has the world's most ridiculous skill tree.
www.pathofexile.com

Lord of the Rings Online

Rift may be much shinier, and *Dungeons & Dragons: Online* might be more familiar to most gamers, but *LOTRO* will always have a special place in our hearts. Players take control of an innocent, whose plot tracks alongside the *Lord of the Rings* books, supporting the Fellowship quietly. With beautiful recreations of the Shire, Rivendell, Moria, and Weathertop, it genuinely feels like Middle-earth. You can also play as a max-level monster in PvP. We just hope they can keep the game going to complete the story.

www.lotro.com


Lair of the Elder Mind
Round: 1
jon
Melvin
Battle Log
World
Friends
Type your message here
Send
Elder Mind
Health 15/15 Draws 3
2/2 Mind Flensers
Riptide
Health 25/25 Draws 3
It is your turn to play.
Pass
Your Turn
Krontrogg
Health 33/33 Draws 2
Zedaqin
Health 25/25 Draws 2
Halberdil
Health 17/17 Draws 2

Mind Flensers drew a card.
Mind Flensers drew a card.
Mind Flensers drew a card.
Riptide drew Fly.
Riptide drew a card.
Riptide drew a card.
Riptide drew a card.
Riptide drew a card.

Card Hunter

One of the smartest games around, *Card Hunter* is a mix of *D&D* and *Magic: The Gathering*. You take the role of a team playing an RPG. You have three characters, each with a deck of cards determined by their class, race, and equipment. With a plot following the fictional roleplay session, as well as a separate story in-game, there's also a PvP mode and an expansion added science-fiction tropes.

http://bit.ly/1MOl7zt

Westerado

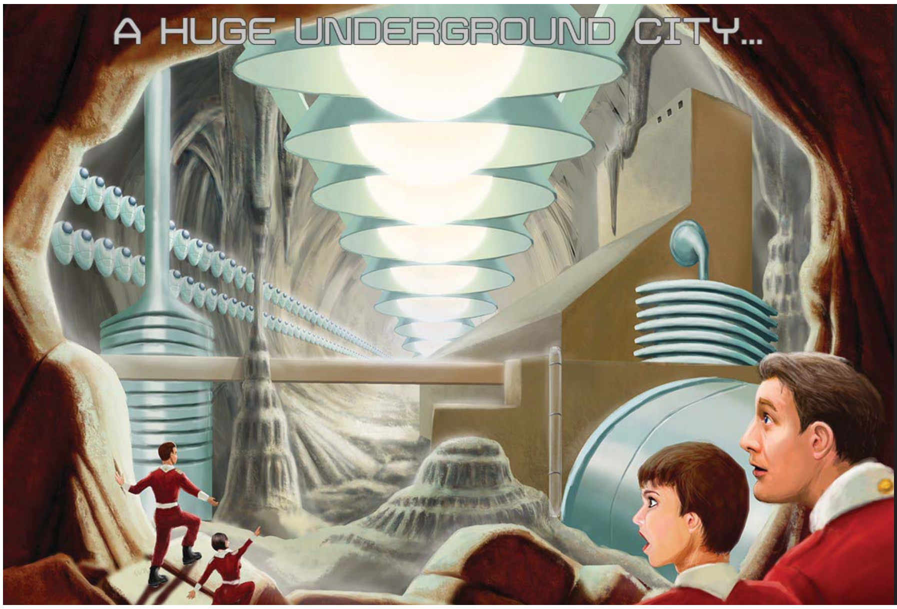
The West was a hard place, full of hard men, hard women, and hard horses. Men with identical faces who you try to recognize from wanted posters. Men whose hats you can shoot off. Men who can pull a gun at any point during a conversation, just to make a point. *Westerado* is half *Zelda* world exploration game and half slapstick-gritty tale of cowboy revenge, incredibly stylish and totally free. If you want to support the developers, a paid-for version of the game with slightly more content is available on Steam.

http://bit.ly/1dVw25e

Planetside 2

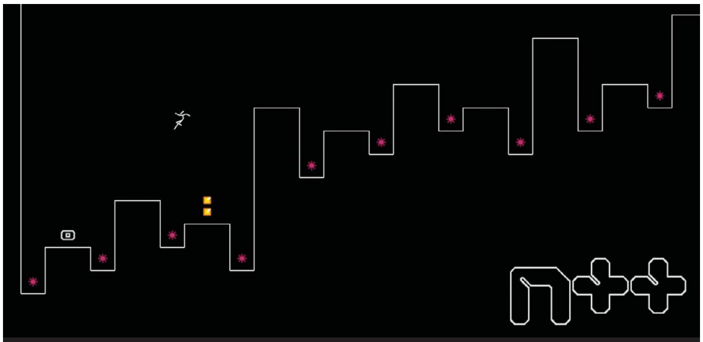
Team Fortress 2 might have the best small team combat in the world, but if you want combined arms combat—that is a huge variety of tanks, vehicles, infantry, and aircraft—then the *Planetside* series is where you've got to go. Players join one of three factions fighting across several continents on a huge open world. The FPS combat and world layout are smartly done, so players can find themselves in huge battles or playing cat and mouse in empty enemy bases. The only caveat is that levelling up takes some time and the real money kit is rather expensive.

www.planetside2.com


A HUGE UNDERGROUND CITY...

The Ur-Quan Masters

Once upon a time (1992), there was a game called *Star Control II*. It was one of those games that did just about everything—a science-fiction game involving the exploration of star systems, hyperspace travel, alien diplomacy, and a range of 25 different alien species to “engage” with. Really, beneath that skin, it was an adventure game, where you pilot the last surviving free spaceship in a bid to free the galaxy from the despotic Ur-Quan, while they’re distracted by civil war. *The Ur-Quan Masters* is an open-source 2002 port that brought *Star Control II* to modern operating systems, for which we’re very grateful. This link is to an HD version. http://urquanmastershd.com



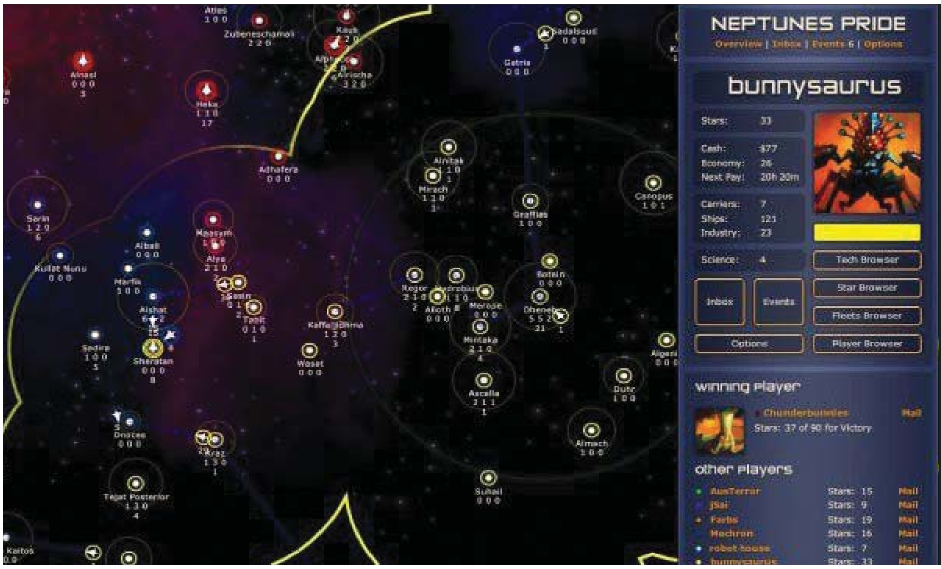
N 2.0

The *N* games have quietly been the inspiration behind many other action-puzzle games but have never achieved mainstream success. You control a highly agile and flexible ninja making his way through a maze of death. Homing missiles, mines, and plain nasty gravity are all threats as you collect keys and points, and attempt to complete each level in double-quick time. If you like this, you can buy the comprehensive *N++*, which has just come out. http://bit.ly/1mQIEnc

Frog Fractions

Comedy is rare in games, and more frequently unintentional or emergent than scripted. Except for a few adventure games, and *Frog Fractions*. The game is a mix of parody and adventure that only lasts an hour, but takes you through politics, philosophy, drama, a law court, a strange upgrade tree, and much time spent eating insects. The sequel has been Kickstarted but not released, and the creator has suggested he could release it under a different name. http://twinbeard.com/frog-fractions/

FROG FRACTIONS



bunnysaurus

Stars: 33

Cash: $77
Economy: 26
Next Pay: 20h 20m

Carriers: 7
Ships: 121
Industry: 23

Science: 4

winning Player

Chunderbunnies
Stars: 37 of 90 for Victory

other Players

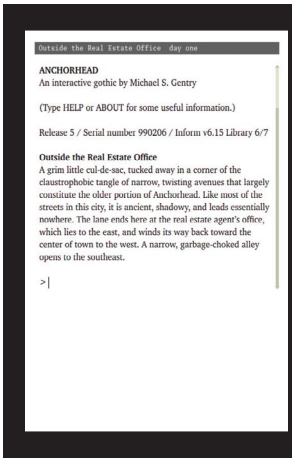
AusTerror	Stars: 15	Mail
jSai	Stars: 9	Mail
Fartis	Stars: 19	Mail
Mechron	Stars: 16	Mail
robot house	Stars: 7	Mail
bunnysaurus	Stars: 33	Mail

Neptune's Pride 2

How much do you like your friends? *Really* like them? How much would it take to break you apart? If the answer is “not a lot,” then you might want to avoid *Neptune’s Pride*. This, like the board game Diplomacy, is a game of power balances and betrayal set within a galactic space. You gradually build your fleets and your friendships with your neighbours, conducting diplomacy, researching technology, forming alliances, reinforcing your planets, and investing in peace... and then you turn on each other in an orgy of destruction. As each game can take several weeks to play out, the betrayals really hurt. http://np.ironhelmet.com

Samorost 1 & 2

Amanita's delightful browser games (named after the Czech word for "driftwood") are set on a strange, small planet inhabited by a gnome. You control him to avert a collision with a spaceship by solving a series of surreal organic puzzles. Creative character designs, innovative art, and a haunting soundtrack made both games a success. Later, the same company made *Machinarium*, generally reckoned the best indie game of 2009. Now it's working on *Samorost 3*.
http://amanita-design.net/games.html



Outside the Real Estate Office day one

ANCHORHEAD
An interactive gothic by Michael S. Gentry

(Type HELP or ABOUT for some useful information.)

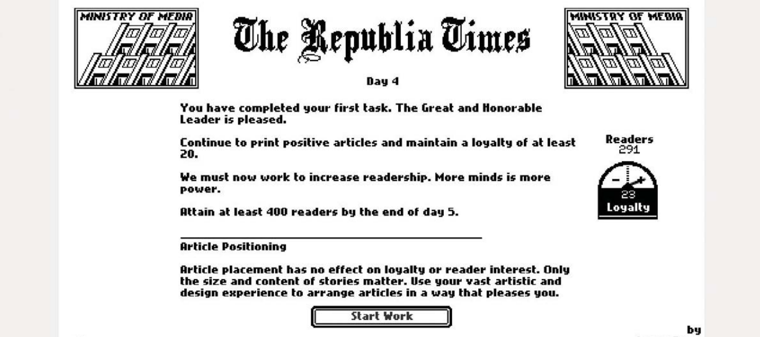
Release 5 / Serial number 990206 / Inform v6.15 Library 6/7

Outside the Real Estate Office
A grim little cul-de-sac, tucked away in a corner of the claustrophobic tangle of narrow, twisting avenues that largely constitute the older portion of Anchorhead. Like most of the streets in this city, it is ancient, shadowy, and leads essentially nowhere. The lane ends here at the real estate agent's office, which lies to the east, and winds its way back toward the center of town to the west. A narrow, garbage-choked alley opens to the southeast.

>|

Anchorhead

There are thousands of excellent text adventures available for free, from the older *Zork* games to Inform and Twine games such as *Horse Masters*, *Slouching Towards Bedlam*, *Violet*, *Galatea*, *80 Days*, *My Father's Long, Long Legs*, and many more. Visit www.ifarchive.org to find out more. *Anchorhead* just happens to be one of the best-written and most-accessible interactive fiction games, set in the Cthulhu mythos. You're moving with your husband to a new house and new town, but something very old and nasty is stirring.
http://pr-if.org/play/anchorhead/



Day 4

You have completed your first task. The Great and Honorable Leader is pleased.

Continue to print positive articles and maintain a loyalty of at least 20.

We must now work to increase readership. More minds is more power.

Attain at least 400 readers by the end of day 5.

Article Positioning

Article placement has no effect on loyalty or reader interest. Only the size and content of stories matter. Use your vast artistic and design experience to arrange articles in a way that pleases you.

The Republia Times

Lucas Pope is better known for creating *Papers Please*, the dystopian border control game, where you have to balance your family's welfare, a totalitarian state's insane laws, and the lives of those crossing the border. *The Republia Times* is another small game of his, this time focusing on the role of state media. As the editor of a propaganda newspaper, your job is to keep as many of the people loyal as possible, despite the dreadful things your regime is doing, by emphasizing only positive stories.
http://bit.ly/1JuTKYS

The Future of Free

Mark Sorrell, from *Angry Birds* creator Rovio, talks behavioral science and economics

What's the state of play of F2P?
It's fine. That is a rather broad question. F2P is healthy and growing. It's still young and, despite the number of entrants to the genre, there is surprisingly little innovation or new thinking, particularly in the West. But make no mistake, the biggest games on the planet are free to play, and due to the importance of network effects in making F2P economies work, are only strengthening their positions over time.

Is there a type of game where the paid model still makes sense?
This depends very much on how you define "type of game," but certainly if you have a very clearly defined and enthusiastic user base, who are happy to pay up-front and willing to buy further content inside the game, then it's possible to make great returns with a pay up-front system.

The free part of free-to-play is a marketing stunt. Combining the large user bases free can provide with the variable pricing of an IAP economy is how F2P has become so dominant—barriers to entry are as low as possible and potential upside is as high as possible. So paid models can still make huge money where two things are true. A high enough percentage of their total addressable market must be willing to pay and the game must feature lots of things to buy inside the game.

With expensive hardware-heavy tech, like VR, does F2P still have an advantage, given the consumer-level financial barriers to entry?
No. VR seems likely to remain a novelty for early adopters for a significant time to come, and they are exactly the sort of clearly defined and enthusiastic user base that are easy to market to and willing to pay up-front. They are also likely to be willing to pay a considerable premium for the chance to show-off or experience their new toy at its best. Alongside that, the hardware requirements will shrink the market, which makes the social drivers behind a lot of F2P spending harder to engineer. And then the sessioning the hardware demands (you have to put a big metal hat on) further limits game design. So, where F2P will work, it will be the *League of Legends*/*Hearthstone* kind of design, rather than anything from mobile.

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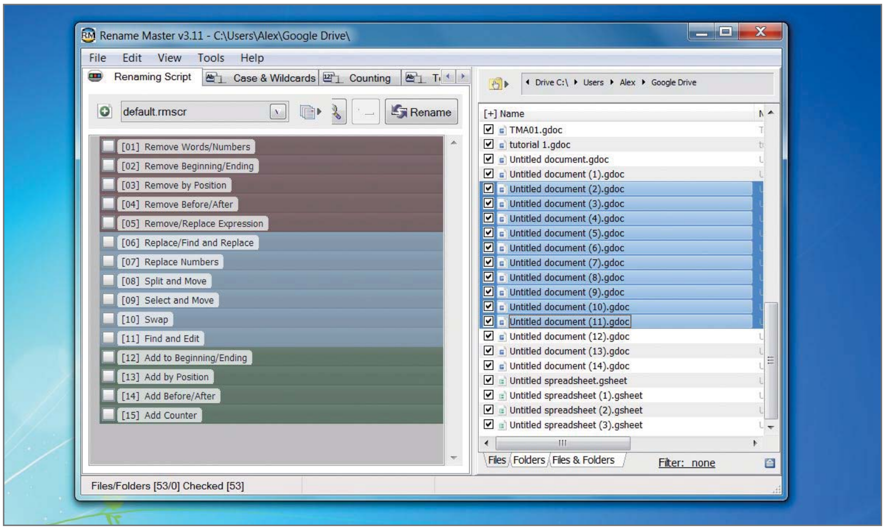
HOW TO

STEP-BY-STEP GUIDES TO IMPROVING YOUR PC

WINDOWS TIP OF THE MONTH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File Edit View Tools Help
Renaming Script
Case & Wildcards
Counting
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default.rmscr
Rename
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Files Folders Files & Folders
Filter: none

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[02] Remove Beginning/Ending
[03] Remove by Position
[04] Remove Before/After
[05] Remove/Replace Expression
[06] Replace/Find and Replace
[07] Replace Numbers
[08] Split and Move
[09] Select and Move
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Files/Folders [53/0] Checked [53]

GET ORGANIZED WITH RENAME MASTER

Few things annoy us more than the filenames that cameras give to photos. We get that it doesn't just *know* to call it "Jarreds-birthday-surprise-2," but that doesn't make it any less frustrating. That's where free utility Rename Master (http://bit.ly/1XarlNF) comes in. It makes it super-easy to rename whole batches of files, whether they are pictures, videos or songs.

MAKE – USE – CREATE

60 Set up your own OwnCloud server

64 Record games and apps in Win10

68 What Gloriousness Really Looks Like

ANDREW WESTBROOK
CONTRIBUTING EDITOR

CAN YOU HEAR VOICES?

Yes, Windows 10 is all very exciting. But let's face it, even if the privacy issues don't leave you squinting all suspiciously at the Redmond outfit, there's bound to be a utility or two that inspires a distinct feeling of, well, meh.

One-such feature could be the much-hyped and sometimes impressive digital personal assistant known as Cortana. Yes, it has become far more integrated. And yes, it has much improved its skills across a wide variety of uses. And yes, that's all on top of also being a decorated war vet. But it's not all rosy. Especially if you enjoy using non-Microsoft products.

However, while Cortana unsurprisingly defaults to Microsoft's search engine Bing, that's not the way it has to be. If you have Chrome as your default browser, then grab the Chrometana extension. This redirects Cortana searches to your search engine of choice, such as DuckDuckGo or Google, rather than Bing.

Indeed, if you generally prefer to use Google's voice-control system, you can take this further by enabling Google Voice Search, which is disabled by default. Just open Chrome and type "chrome://settings/" into the address bar. In the search section, check the "Enable OK Google" box, then open a new tab and say "OK Google", followed by a command. This performs a simple Google search, and includes tools such as the calculator, calendar and Wikipedia summaries.

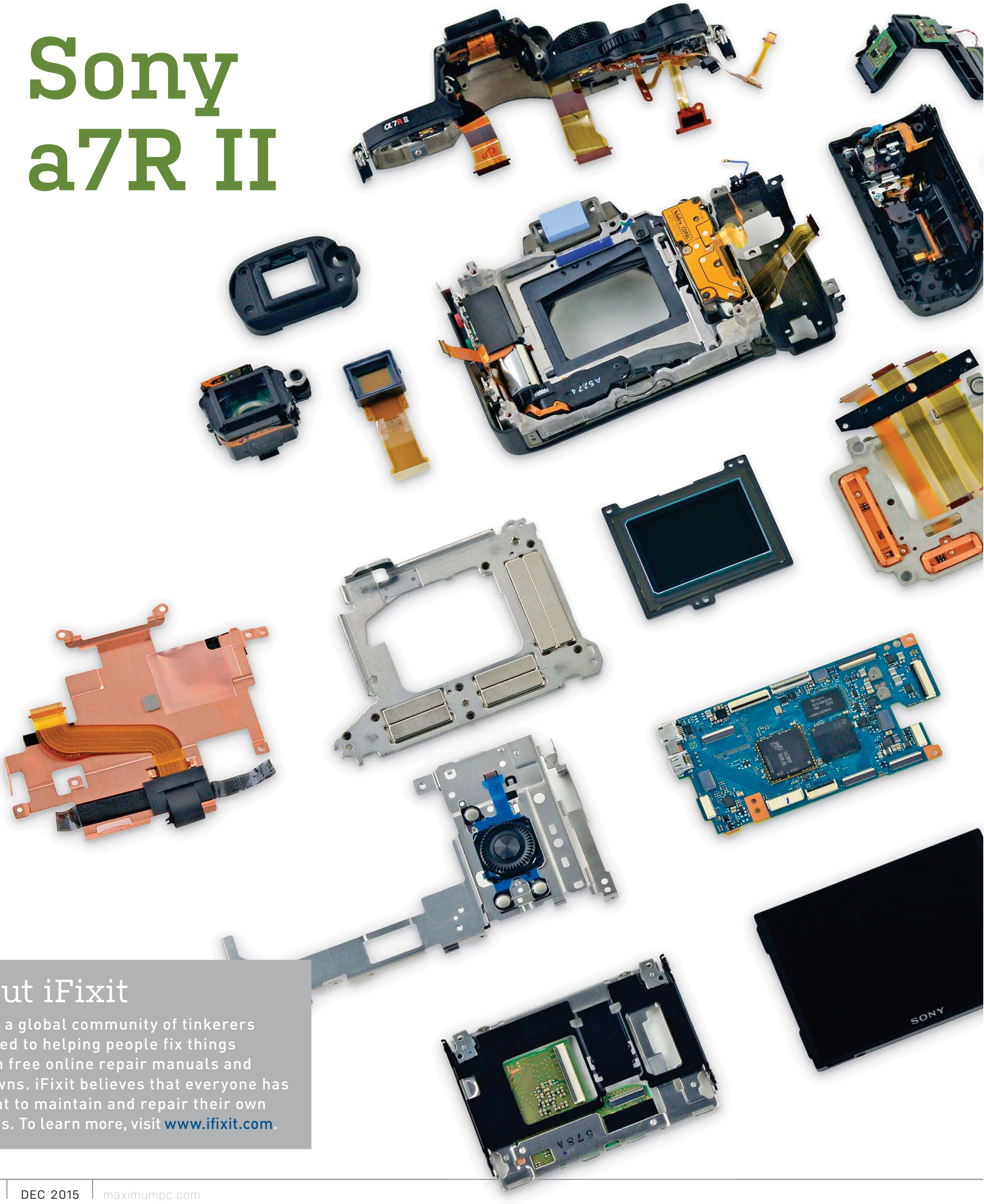
↘ submit your How To project idea to: comments@maximumpc.com

IFIXIT presents:

AUTOPSY

THIS MONTH WE DISSECT...

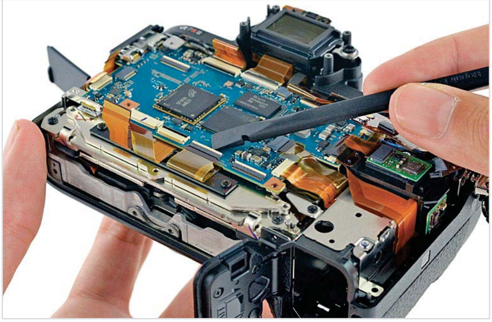
Sony a7R II



About iFixit

iFixit is a global community of tinkerers dedicated to helping people fix things through free online repair manuals and teardowns. iFixit believes that everyone has the right to maintain and repair their own products. To learn more, visit www.ifixit.com.

“That’s a lot of elements by anyone’s standards.”



“If what you need is ribbons, Sony has you covered.”

BACKGROUND:

The a7R II is Sony’s second shot at a professional-grade mirrorless interchangeable-lens camera, but this time, Sony claims it can keep up with any Canikon DSLR. While trial by fire may be the best way to judge a camera, trial by teardown is our specialty. With a $3,199 price tag and no reflex system, we hope this mostly-solid-state camera comes with an equally hefty repairability score.

MAJOR TECH SPECS:

- 42.4 MP Exmor R CMOS back-illuminated sensor
- BIONZ X image processor
- 5-axis in-body optical image stabilization
- 4K video recording
- Fast hybrid AF system with 399 focus points
- NFC and Wi-Fi connectivity

KEY FINDINGS:

- The rear of the camera is adorned with an articulating 3-inch LCD. This is a TFT LCD display with 1,228,800 dots. Dots? Since nobody lists a measurement other than 3 inches for this display, we busted out the calipers and calculator. At 2.5” x 1.75”, and converting from dots to pixels, we came up with around 270 ppi.
- We turn our attention to the JIS screws securing the bottom plate, mouths watering in anticipation of the tech beneath. And find the tripod mount plate. It may not be glamorous, but the mount slides out with ease, great news for repairability.
- Peeling the LCD from the articulating bracket reveals a PCB packed with passives. This little circuit board is probably a breakout board for the LCD, allowing for a thinner cable.
- Once we extricate the LCD and its delicate flex cable, the parts start flying. First up are the eyepiece and viewfinder frame. The eyepiece slides off for easy swaps; the viewfinder frame is held in place with a few screws. As a mirrorless camera, the a7R II doesn’t have an optical viewfinder. Instead, the viewfinder uses an XGA (1024 x 768 pixels) OLED screen to provide the user with accurate previews of images.
- Back to the viewfinder—turns out we can pull it straight out of its cavity. With its frame previously dispatched, it was only held in place by a gummy thermal pad. Why the thermal pad? Might have something to do with the 1.3 cm XGA OLED. With 1024 x 768 pixels in half an inch, that’s 2,560 ppi. Wowza.
- A7R II Repairability Score: 4 out of 10 (10 is easiest to repair). The tripod mount and viewfinder can be replaced without disassembling the camera body. While very difficult, the rear LCD panel can also be removed without disassembling the camera body. Accessing anything inside the camera requires removing the complex rear LCD panel first. Internal components are very intricately organized; repair without a service manual would be very difficult.

Set Up Your Own Cloud Service

YOU'LL NEED THIS

RASPBERRY PI 2
The brilliant mini-computer costs under $45. See www.raspberrypi.org.

USB PORTABLE DISK
Ideally a self-powered disk that doesn't draw power from the Raspberry Pi.

DO YOU WANT the convenience of an omnipresent Dropbox-like storage service without doling out wads of cash and your data to a third party? OwnCloud is one of the best pieces of open-source software to help you create your own private and protected cloud-sharing service.

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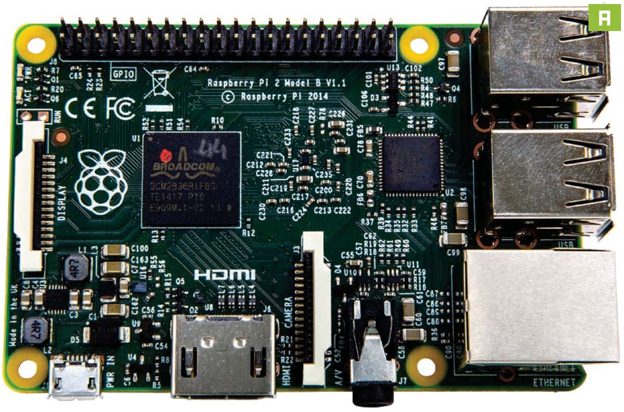


1 LAY THE GROUNDWORK

In this tutorial, we're setting up the OwnCloud server on top of the Raspbian distribution for the Raspberry Pi [**Image A**]. The server software has modest requirements and it performs well, even on the Raspberry Pi Model B, in certain small and controlled environments, such as your house. You also need a USB portable disk for storing the data. For maximum reliability and performance, it's best to use a self-powered disk that doesn't draw power from the Raspberry Pi. Before you begin setting up the server, make sure the Raspberry Pi has a static IP address. The easiest way to do this is to tie an IP address to your Pi's unique MAC address in your router's admin page. Here, we're assuming the Pi is at 192.168.3.111—change as appropriate.

2 INSTALL OWNCLOUD

Raspbian is based on the Debian OS, so we can pull in packages from OwnCloud's Debian repository. Fire up a terminal and add the OwnCloud repositories with:

```
$ wget http://download.opensuse.org/repositories/
isv:OwnCloud:community/Debian_7.0/Release.key
$ sudo apt-key add - < Release.key
```

» You can now refresh the repositories with:

```
$ sudo apt-get update
```

» Now install the OwnCloud server and all its required dependencies as follows:

```
$ sudo apt-get install owncloud.
```

» This also pulls in and sets up the MySQL database, and you're asked to set up a root password. In addition to installing the required components, the above command automatically configures the Apache web server to talk to the OwnCloud installation. You need to enable certain Apache modules. In a terminal, enter:

```
$ sudo a2enmod headers rewrite env
```

» Then restart Apache using:

```
$ sudo apachectl restart.
```

» You have to tweak the configuration file of PHP if you wish to upload files that are greater than 2MB in size. To do that, open the PHP configuration file, "php.ini," housed under "/etc/php5/apache2," in a text editor. Look for the "upload_max_filesize" and "post_max_size variables" and change their value from "2M" to something like "1024M" or even "2G." Optionally, on larger installations, you can also install the APC PHP accelerator to make the OwnCloud installation snappier. Pull in the components with "sudo apt-get install php-apc" and then open APC's configuration file and add:

```
$ sudo nano /etc/php5/conf.d/20-apc.ini
extension=apc.so apc.enabled=1 apc.shm_size=12M
```

» Then bring the cache online by restarting Apache with:

```
$ sudo apachectl restart
```

3 MOUNT THE DRIVE

Now that the server is set up and configured, it's time to prepare the storage medium. Plug the USB disk into the Pi and enter "sudo blkid" in a terminal. The USB disk is probably mounted as "/dev/sda1" if you don't have any other USB disks attached. Make a note of the corresponding UUID, which looks something like "6154-F660." Now create a directory to mount this drive using:

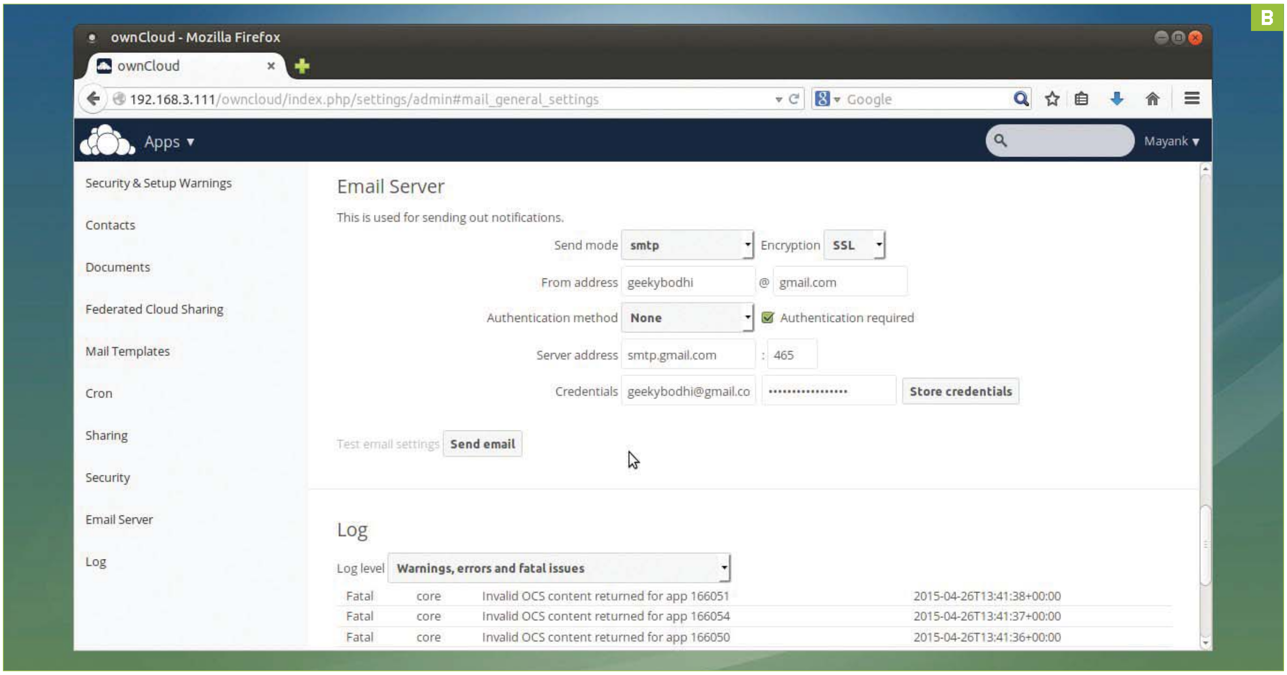
```
$ sudo mkdir /media/owncloud
```

» Then mount the drive with:

```
$ sudo mount -t vfat -o umask=007,auto,uid=33,gid=33 /
dev/sda1 /media/owncloud
```

» The above command assumes your drive has a FAT32 filesystem and is mounted at "/dev/sda1." Once the drive is mounted correctly, you can edit the "fstab" file to make sure it's automatically mounted:

```
$ sudo nano /etc/fstab
UUID=6154-F660  /media/owncloud/  vfat
rw,umask=007,auto,uid=33,gid=33 0 0
```



192.168.3.111/owncloud/index.php/settings/admin#mail_general_settings

Email Server

This is used for sending out notifications.

Send mode: smtp
Encryption: SSL
From address: geekybodhi @ gmail.com
Authentication method: None
☑ Authentication required
Server address: smtp.gmail.com : 465
Credentials: geekybodhi@gmail.co ••••••••••••••••
Test email settings

Log

Log level: Warnings, errors and fatal issues

```
Fatal   core   Invalid OCS content returned for app 166051   2015-04-26T13:41:38+00:00
Fatal   core   Invalid OCS content returned for app 166054   2015-04-26T13:41:37+00:00
Fatal   core   Invalid OCS content returned for app 166050   2015-04-26T13:41:36+00:00
```

4 CONFIGURE THE CLOUD

That's all there is to installing the server components. You're now all set to configure your cloud. Launch a web browser and navigate to the OwnCloud installation instance at "192.168.3.111/owncloud." Because this is a brand new installation, you're asked to create a new user account for the OwnCloud administrator.

›› Next, we need to ask OwnCloud to use the MySQL database and store files under the mounted USB drive. For this, click the "Storage & Database" pull-down menu. Then enter "/media/owncloud/data" in the text box corresponding to the "Data Folder" entry and select the "MySQL/MariaDB" option in the "Database" section. You're asked to enter the connection details of the database server, so just enter "localhost" as the host and "root" as the username, along with the password you configured when the database was pulled in along with OwnCloud. That's it—you've set up OwnCloud. You can now log into your cloud server as the administrator using the credentials you've just created.

5 CHANGE SETTINGS

While you can start using the server to upload and download files straight away, let's take a moment to get your house in order. For starters, when you log into the OwnCloud server, click the pull-down menu next to your username and click "Personal." Here you can change the settings for your account, such as the login password and display name. You can also add a profile picture and configure how you'd like to be notified about certain actions [**Image B**].

›› Also, if your cloud is going to be used by multiple people, it's advisable to add users and organize them into different groups. To do this, select the "Users" option from the pull-down menu. While adding users, you can restrict their storage space and even share your admin responsibilities with other users, and mark certain users as admins for a particular group.

READY-MADE SOLUTIONS

Although it doesn't take too much effort to install and configure the OwnCloud server from scratch, there's a couple of ways to save time and effort. The guys behind PetRockBlog have written a script that automates the whole installation process.

The script downloads and sets up an OwnCloud installation on top of a Raspbian distribution. However, unlike our tutorial, the script uses the Nginx web server, instead of the Apache web server. To use the script, install the required components with:

```
$ sudo apt-get install git dialog
```

Then download the script with:

```
$ git clone git://github.com/
petrockblog/ OwncloudPie.git
```

which creates a directory called OwncloudPie. Move into this directory:

```
$ cd OwncloudPie
```

Make the script executable:

```
$ chmod +x owncloudpie_setup.sh
```

Then execute it:

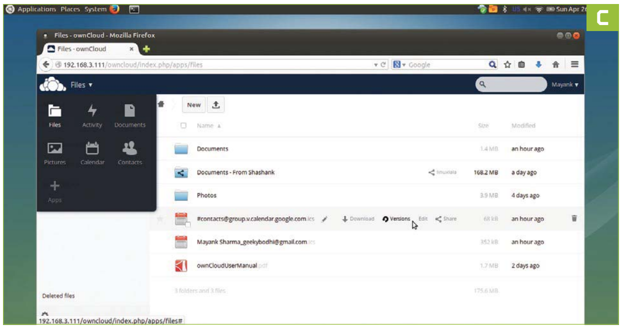
```
$ sudo ./owncloudpie_setup.sh
```

Give it some time to download all the components and configure your server. Once you've installed OwnCloud from the script, you can run it again to update it whenever new versions are released.

If you're the adventurous sort, you can install arkOS (https://arkos.io/) on your Raspberry Pi. In addition to OwnCloud, the distro has other apps to keep you in charge of your data. Head to the downloads page, then download and extract the installer for the Raspberry Pi. Insert an SD card and run the installer with:

```
$ sudo ./arkos-install
```

Follow the steps in the installer to download the image from the internet and install it on to your SD card. Once it's done, boot your Raspberry Pi from it and head to http://arkos:8000 to set up your server.


C
Applications Places System
Sun Apr 2
Files - ownCloud - Mozilla Firefox
Files - ownCloud
192.168.3.111/owncloud/index.php/apps/files
Google
Files ▾
Mayank ▾
Files
Activity
Documents
Pictures
Calendar
Contacts
Apps
New
Download
Versions
Edit
Share
linuxlala
Deleted files
192.168.3.111/owncloud/index.php/apps/files#

Name ▴	Size	Modified
Documents	1.4 MB	an hour ago
Documents - From Shashank	168.2 MB	a day ago
Photos	3.9 MB	4 days ago
#contacts@group.v.calendar.google.com.ics	68 kB	an hour ago
Mayank Sharma_geekybodhi@gmail.com.ics	352 kB	an hour ago
ownCloudUserManual.pdf	1.7 MB	2 days ago
3 folders and 3 files	175.6 MB	

6

UPLOAD AND SHARE FILES

You're now all set to upload data into your OwnCloud server. After you've logged in, you are in the "Files" section [**Image C**]. To upload a file, click the arrow button. To organize files into folders, click the button labelled "New," and select the "Folder" option from the drop-down menu to create a new folder.

» If you've uploaded a file in a format that OwnCloud understands, you can click its name to view and edit the file. OwnCloud can visualize the data it houses in different views. For example, click the "Files" pull-down menu in the top-left corner of the interface, and select "Pictures." This helps you view images in your cloud by filtering out all other types of content.

» Another way to upload files to the server is by using the WebDAV protocol, with this you can access your cloud server from your file manager. For example, in the "Files" file manager, press [Ctrl]–[L] to enable the location area. Here you can point to your OwnCloud server, such as 'dav://192.168.3.111/owncloud/remote.php/webdav'. Once authenticated, the OwnCloud storage is mounted and you can interact with it just like a regular folder.

» To share uploaded files, simply go to the "Files" section in the web interface and hover over the file or folder you wish to share. This displays several options, including "Share," which enables you to select which users or groups you want to share the item with and whether you want to give them permission to edit and delete the files.

» You can also share with someone who isn't registered with your OwnCloud server. Click on 'Share with Link', and OwnCloud displays a link to the item that you can share with anybody on the internet. You can also password-protect the link and set an expiration date too.

» While you can interact with the cloud using the web interface, it's far easier to use one of its official clients. OwnCloud has clients for all the major desktop and mobile platforms. These clients also help you synchronize folders from the desktop to your OwnCloud server with ease.

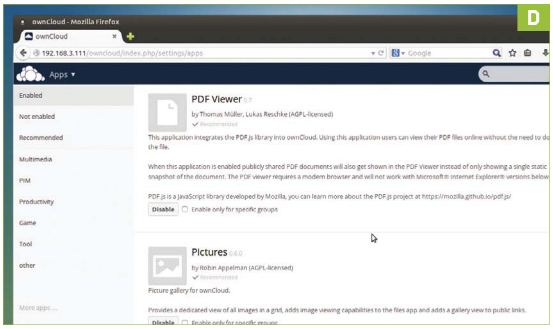
7

SET UP CLIENTS

Most desktop distributions host the Linux client in their official repos. You can also grab the latest version by adding the corresponding repo for your distro from here: http://bit.ly/1HZxhOy. The page has instructions for popular distros including Debian, Fedora, Ubuntu, OpenSUSE and more.

» Head to https://owncloud.org/install/#install-clients, the downloads page on OwnCloud's website to download clients for other platforms. Mobile clients are best fetched from either Apple's App Store or Google's Play Store.

» Once the client is installed, it prompts you for your login credentials in order to connect to the OwnCloud installation. Once connected, the Linux clients create a local sync folder named "owncloud" under the home directory, such as "/home/bodhi/owncloud." Any files you move into this directory are automatically synced to the server. You can also specify one or more directories on a local machine to sync with the OwnCloud server. If a directory is shared with several users, when anyone makes a change to a file on one computer, it automatically flows across to the others. When collaborating with other users, you'll appreciate OwnCloud's version control system, which creates backups of files before modifying them. These backups are accessible via the Versions pull-down option corresponding to each file, along with a Restore button to revert to an older version.



PDF Viewer 0.7

by Thomas Müller, Lukas Reschke (AGPL-licensed)

This application integrates the PDF.js library into ownCloud. Using this application users can view their PDF files online without the need to do the file.

When this application is enabled publicly shared PDF documents will also get shown in the PDF Viewer instead of only showing a single static snapshot of the document. The PDF viewer requires a modern browser and will not work with Microsoft® Internet Explorer® versions below

PDF.js is a JavaScript library developed by Mozilla, you can learn more about the PDF.js project at https://mozilla.github.io/pdf.js/

Pictures 0.6.0

by Robin Appelman (AGPL-licensed)

Picture gallery for ownCloud.

Provides a dedicated view of all images in a grid, adds image viewing capabilities to the files app and adds a gallery view to public links.

» In addition to files and folders, you can also get your calendar and address book synced with your OwnCloud server.

8

INSTALL AND ENABLE APPS

You can extend your default OwnCloud installation by adding (or removing) a bunch of apps. Bring up the pull-down menu in the top-left of the interface and click "Apps." By default, you're shown a list of apps that are already enabled on your installation [**Image D**]. You can browse through this list and read their descriptions to understand them better. You can also disable any enabled app from this section.

» Scroll down and click the "PIM" tab on the left [**Image E**]. This section lists two apps. You can enable either or both the Calendar and Contacts apps. Once you've enabled both, the top-left pull-down menu now includes the Calendar and Contacts option.

» Now you need to import your contacts and calendar from your existing apps into your cloud server. OwnCloud supports the popular vCard file format (which has the .vcf file extension) and almost every popular email app, including online ones such as Gmail, export their address books in this format.

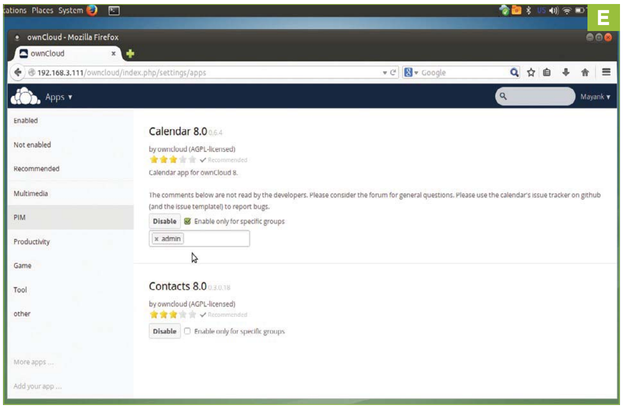
» Similarly, calendars can be imported in the iCal format. Before proceeding further, make sure you download both the .vcf and .ical files from your existing contacts and calendar apps.

» Now, head to Contacts in OwnCloud and click "Import Contacts." In the pop-up window, click "Upload File" and point it to the .vcf file. Once the contacts have been imported, you can sync them with your email clients using CardDAV links. Head to the "Contacts" section in OwnCloud, click the "Gears" icon at the bottom, hover over the name of the address book you imported and click the "Chain" icon. This spits out a CardDAV link for this address book that you can feed to your address book client.

9

SYNC AND SHARE YOUR CALENDAR

Similarly, you can use OwnCloud to manage your calendar and tasks. To create an event in your calendar, head over to the Calendar app. You can view the calendar for the entire month or for the current week. To add a new event, click the appropriate date in the calendar.


E

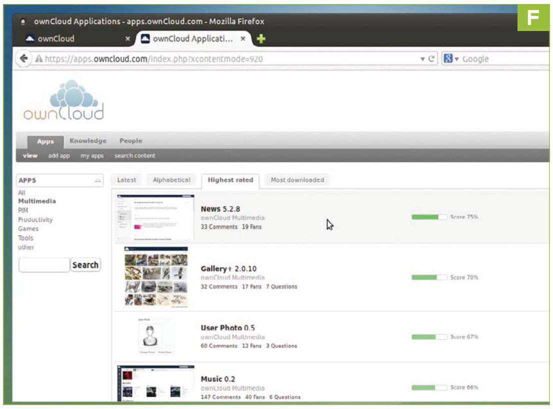
ations Places System
ownCloud - Mozilla Firefox
ownCloud
192.168.3.111/owncloud/index.php/settings/apps
Google
Apps ▾
Mayank ▾
Enabled
Not enabled
Recommended
Multimedia
PIM
Productivity
Game
Tool
other
More apps ...
Add your app ...
Calendar 8.0 0.6.4
by owncloud (AGPL-licensed)
✓ Recommended
Disable
☑ Enable only for specific groups
× admin
Contacts 8.0 0.3.0.18
by owncloud (AGPL-licensed)
✓ Recommended
Disable
☐ Enable only for specific groups

Calendar app for ownCloud 8.

The comments below are not read by the developers. Please consider the forum for general questions. Please use the calendar's issue tracker on github (and the issue template!) to report bugs.

This brings up a window, which gives you several options to configure the event. To import an existing client, simply upload the .ical file to your cloud server. When you click the file in OwnCloud's web interface, the server recognizes the file and offers to import it into an existing calendar or into a new one. Select the option that best suits you.

›› After you've imported the calendar, you can use OwnCloud to share it with other users. Click the "Share Calendar" icon corresponding to the calendar you wish to share. This brings up a pull-down menu, which enables you to select the users or the group of users you wish to share the calendar with. Furthermore, just like address books, OwnCloud can also sync your calendars with desktop and mobile apps that can read this information from CalDAV links. To get the CalDAV link for your calendar, click the "Gears" button and then the "Chain" icon corresponding to the calendar you wish to sync. This displays the link that you can pass on to the clients to keep them in sync with the OwnCloud calendar.


F

ownCloud Applications - apps.ownCloud.com - Mozilla Firefox
ownCloud
ownCloud Applicati...
https://apps.owncloud.com/index.php?xcontentmode=920
Google
ownCloud
Apps
Knowledge
People
view
add app
my apps
search content
APPS
All
Multimedia
PIM
Productivity
Games
Tools
other
Search
Latest
Alphabetical
Highest rated
Most downloaded
News 5.2.8
ownCloud Multimedia
33 Comments 19 Fans
Score 75%
Gallery+ 2.0.10
ownCloud Multimedia
32 Comments 17 Fans 7 Questions
Score 70%
User Photo 0.5
ownCloud Multimedia
60 Comments 12 Fans 3 Questions
Score 67%
Music 0.2
ownCloud Multimedia
147 Comments 40 Fans 6 Questions
Score 66%

›› There's a lot more you can do with OwnCloud. Explore the "Apps" menus to find other ways to flesh out the default installation and extend the functionality of your cloud. In addition to the apps listed in the Apps section on your OwnCloud installation, there are others that you can install from the OwnCloud website. Scroll down the Apps section and click the "More Apps..." link. This takes you to the OwnCloud store at http://apps.owncloud.com [**Image F**]. You can download any app from here and extract it under the '/var/www/owncloud/apps' folder inside the Pi.

UNIVERSAL ACCESS

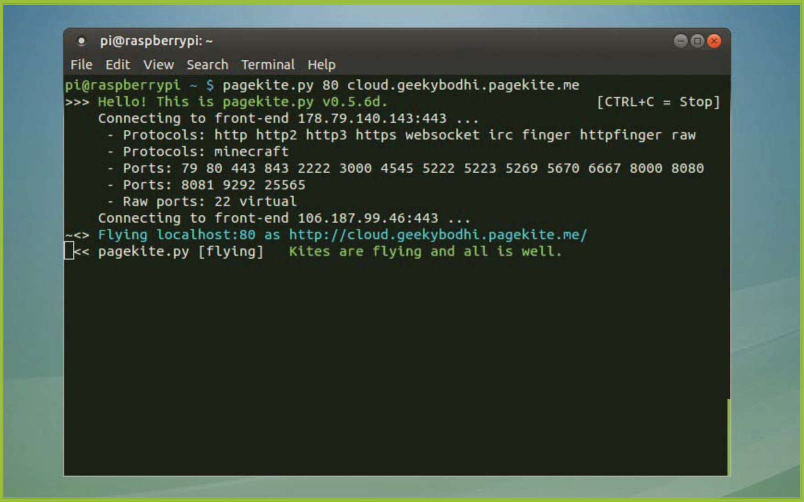
The real advantage of commercial cloud services such as Dropbox is that you can access data stored within them from any computer connected to the internet. However, by default, a self-hosted OwnCloud installation is only accessible from computers and devices that are within the local network.

That's not to say that you can't access your private cloud from the internet. The trickier and more expensive solution is to get a static IP address from your ISP and then poke holes in your router's firewall. Or, you can set up Dynamic DNS in your router or local machine.

The smarter way, however, is to use a tunnelling service, such as PageKite. The service uses a pay-what-you-want model. As a non-commercial user, you can use the service for free by filling out a form once a month, telling PageKite how you use the service. But if that sounds like too much hassle, it's definitely worth the $3 per month minimum it requests from individuals.

First, you need to install PageKite. Launch a terminal and enter:

```
$ curl -s https://pagekite.net/pk/ | sudo bash
```



pi@raspberrypi: ~
File Edit View Search Terminal Help

```
pi@raspberrypi ~ $ pagekite.py 80 cloud.geekybodhi.pagekite.me
>>> Hello! This is pagekite.py v0.5.6d.                    [CTRL+C = Stop]
    Connecting to front-end 178.79.140.143:443 ...
      - Protocols: http http2 http3 https websocket irc finger httpfinger raw
      - Protocols: minecraft
      - Ports: 79 80 443 843 2222 3000 4545 5222 5223 5269 5670 6667 8000 8080
      - Ports: 8081 9292 25565
      - Raw ports: 22 virtual
    Connecting to front-end 106.187.99.46:443 ...
~<> Flying localhost:80 as http://cloud.geekybodhi.pagekite.me/
 << pagekite.py [flying]   Kites are flying and all is well.
```

PageKite is certainly worth the $3 per month minimum fee.

When it's done, make your local web server public by entering the following command:

```
$ pagekite.py 80 mycloudserver.pagekite.me
```

Also, remember to replace "mycloudserver" with the name you want for your OwnCloud server. Now you can access your own personal OwnCloud instance by heading over to http://mycloudserver.pagekite.me from any computer, anywhere in the world.

The first time you run this command, PageKite runs you through its brief sign-up process and will ask you for your email address.

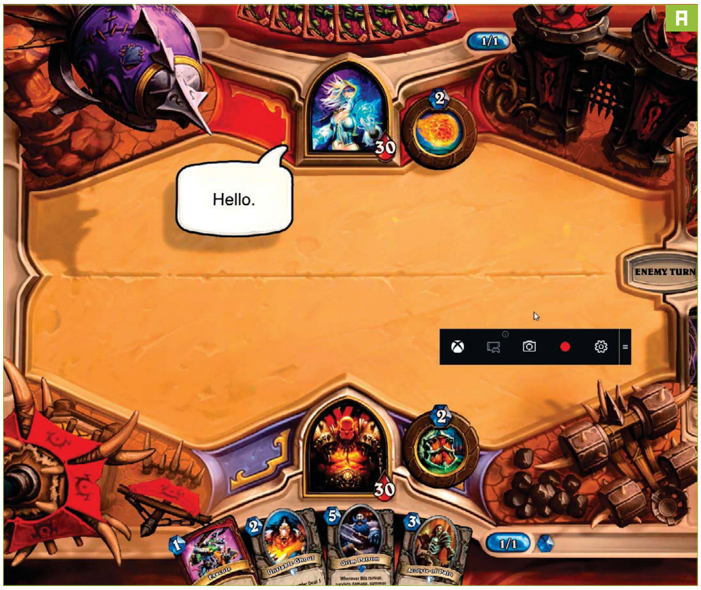
Record your Screen on Windows 10

YOU'LL NEED THIS

WINDOWS 10
Get the latest OS from www.microsoft.com.

BEING ABLE TO RECORD your screen can be helpful if you want to demonstrate to someone how a tricky thing is done in Photoshop, or show off your ungodly gaming skills on YouTube. Either way, up until now it's involved installing a third-party tool and then fiddling with it until it works. With the advent of Windows 10, however, Microsoft has bundled in a screen-recording app as part of its Xbox integration features. It's clearly meant for use when gaming, but oddly enough, it works with any desktop app—all you have to do is tell Windows that it's a game.

There's a simple keyboard shortcut to bring up the Xbox app and start recording. Microsoft hasn't officially announced this feature, so there's a chance it could be modified or patched away with a future update, but it works fine for now. –IAN EVENDEN



1 PREPARATION

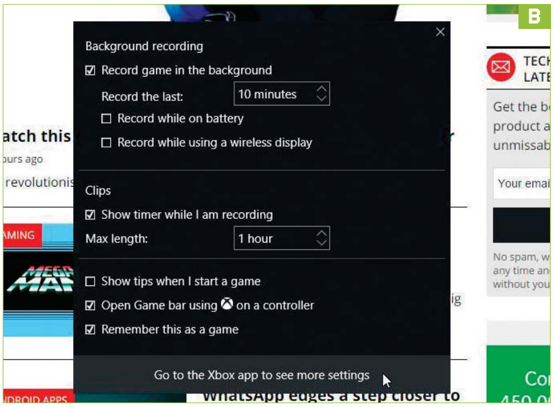
Unless you happen to get lucky and catch your boss slipping on a pile of manure and into a burning patch of poison oak, the best videos tend to be planned in advance. Write out a running order for your video on a piece of paper, keep it out of shot, and rehearse a few times. If you're capturing game footage, think about what you want your capture to show. Equip the items you need, pause the game, then unpause it after you begin recording—you can trim the footage later.

2 THE GAME BAR

It's not somewhere you'd go for an anonymous liaison with a woodcock, but a built-in Windows screen overlay that's meant to record Xbox One apps being streamed to your PC. Open it with [Windows]-[G]. It's worth doing this at least once before recording as it comes up more slowly the first time.

3 GET TO KNOW THE CONTROLS

The Game Bar is fairly straightforward, with a red recording button that's just begging to be pressed [**Image A**]. There are four others though—the Xbox logo opens the Xbox app; the next—"Record That"—turns on background recording; then there's the camera button, which takes a screenshot; and the 'Record' button itself. The cogwheel opens up the settings [**Image B**].



Background recording
☑ Record game in the background
Record the last: 10 minutes
☐ Record while on battery
☐ Record while using a wireless display

Clips
☑ Show timer while I am recording
Max length: 1 hour

☐ Show tips when I start a game
☑ Open Game bar using Ⓧ on a controller
☑ Remember this as a game

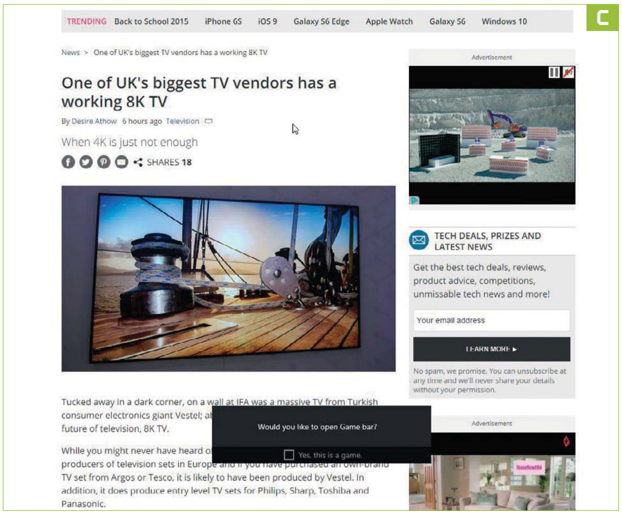
Go to the Xbox app to see more settings

WINDOWS MOVIE MAKER

Windows 10 doesn't have a built-in video editing app, and the Store is rather lightly populated by them.

However, you don't have to shell out on a brand new copy of Adobe Premiere Elements (unless you really want to; it's a fine application) as the Windows 8 version of Movie Maker is still available for free and works with Windows 10. Head to http://bit.ly/1oiRnLg and click the top option to begin the download.

Simply install it as usual, though you probably won't want the other applications bundled with it, such as the defunct Microsoft Messenger. Alternatively, if you upload your raw clips to YouTube but don't publish them, you can still use the site's editor (http://bit.ly/ZLeWqp) to knock your videos into shape, creating a new movie from them that you can then happily publish.


C
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News > One of UK's biggest TV vendors has a working 8K TV
SHARES 18
Advertisement
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One of UK's biggest TV vendors has a working 8K TV

By Desire Athow 6 hours ago Television

When 4K is just not enough

Tucked away in a dark corner, on a wall at IFA was a massive TV from Turkish consumer electronics giant Vestel; ab future of television, 8K TV.

While you might never have heard o producers of television sets in Europe TV set from Argos or Tesco, it is likely to have been produced by Vestel. In addition, it does produce entry level TV sets for Philips, Sharp, Toshiba and Panasonic.

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Would you like to open Game bar?

☐ Yes, this is a game.

4 SETTINGS

The app only captures the currently active window, so it's worth having it maximized or in a borderless window mode if you want it to fill a 16:9 screen on playback. Most settings are in the Xbox app, under 'Game DVR', but the Game Bar has a few, too, including whether it should remember that the current app is a game.

5 YES, MY BROWSER IS A GAME

It sounds crazy, but the Game Bar really does ask if your current application is a game when it launches [**Image C**]. It also trusts you completely—Chrome, Photoshop and Word all become games if you tick the box. From the settings icon on the bar, you'll be able to tell it to remember that your selected app is a game, so it won't ask again. Once this is done, the bar opens as normal.

6 START RECORDING

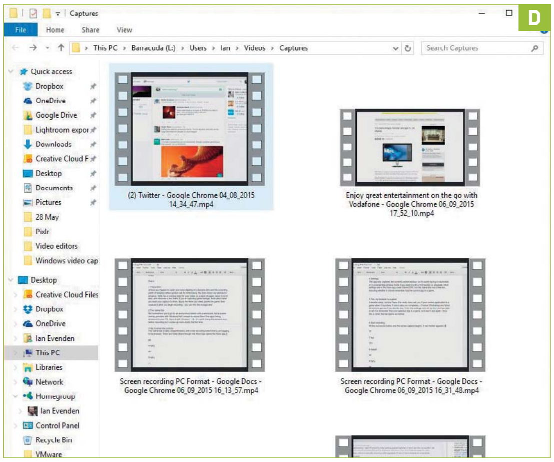
Hit the red record button and the screen capture begins. A red marker appears in the top corner of your window with a counter to see how long you've been going. Click the arrow on this and it'll disappear, but it doesn't appear on the final video so can be safely left there. When you want to stop recording, press [Windows]–[G] again and the bar will reappear, with a "Stop" button next to its counter.

7 GET NOTIFIED

When you stop, you'll get a notification in the bottom-right of the screen that your video has been saved. Click this and you'll be taken to the Xbox app, where a list of all your videos can be found. There are a few options on this screen. You can rename your file, trim it, and play it back, but unless you captured from a game, the Xbox app recognizes the "Share" button won't work, as it's sharing to Xbox Live rather than Twitter, and Live is a games-only zone. To share the old-fashioned way, use the "Open Folder" button to get at the file [**Image D**].

8 MORE SETTINGS

There are a few quality settings in the Xbox app, which affect not just the quality of the saved video, but also the strain its capture puts on your PC. If you're having trouble maintaining a playable frame rate while capturing (this is less of a problem when capturing from non-game apps), then turning down the quality can help you out. We tested the quality levels, and didn't notice a huge difference when uploaded to YouTube.


D
Captures
File
Home
Share
View
This PC > Barracuda (L:) > Users > Ian > Videos > Captures
Search Captures
Quick access
Dropbox
OneDrive
Google Drive
Lightroom expor
Downloads
Creative Cloud F
Desktop
Documents
Pictures
28 May
Pixlr
Video editors
Windows video cap
Desktop
Creative Cloud Files
Dropbox
OneDrive
Ian Evenden
This PC
Libraries
Network
Homegroup
Ian Evenden
Control Panel
Recycle Bin
VMware
(2) Twitter - Google Chrome 04_08_2015 14_34_47.mp4
Enjoy great entertainment on the go with Vodafone - Google Chrome 06_09_2015 17_52_10.mp4
Screen recording PC Format - Google Docs - Google Chrome 06_09_2015 16_13_57.mp4
Screen recording PC Format - Google Docs - Google Chrome 06_09_2015 16_31_48.mp4

9 BACKGROUND CAPTURE

A little like Nvidia's Shadowplay, this makes a user-defined amount of game time—from 15 seconds to 10 minutes—available for capture. Take a tour of Mother Base or pull off an outrageous takedown, and you can save it with a keystroke to share later—hit [Win]–[Alt]–[G], but you need to have enabled it first in Xbox app settings and switched it on with the Game Bar.

10 FILE HANDLING

The files produced by Game DVR are in MP4 format, but their resolution depends on the size of the window you had open when you started capturing. If it was 1,036 pixels high, your video will be too, and some editing apps might have a problem with this—we tried it in Windows Movie Maker (see "Windows Movie Maker", opposite), however, and it was fine, adding black bars either side.

If you want to make sure you're capturing a full 1080p frame (or higher if you're fancy), you might want to use background capture in full screen mode. Check its settings to make sure it doesn't stop recording before you've finished.

ALTERNATIVE SIMPLE RECORDING OPTIONS

1 SHADOWPLAY

Nvidia's recording option saves the last 20 minutes of your gameplay, and needs to be turned on in the GeForce Experience app. It claims about a 5 per cent performance hit, and works up to 4K resolutions. AMD users can use the AMD Gaming Evolved app in a similar way.

2 EZVID

A free screen recorder and basic editor, EZvid can record games as long as they're running in windowed mode – it captures the entire screen, so any app can be recorded. You can also use it to make a slideshow from stills, useful for tutorial videos.

3 CAMSTUDIO

A recording app that's full of options – hide or reveal the mouse pointer, record program sounds, record voiceover from a mic and so on. It'll save your captures as an AVI file, and convert them to a Flash video if you really want it to.

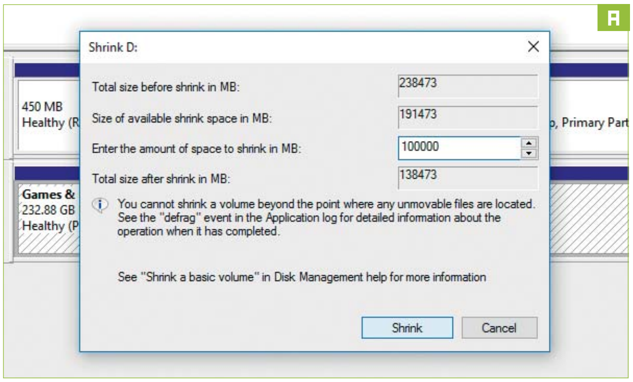
Backing up your Windows 10 PC

YOU'LL NEED THIS

WINDOWS 10 INSTALL
HDD or SSD with additional unused space.

TODAY IS AN INCREDIBLE TIME TO BE ALIVE. Over the last 10 years the world has created a torrent of digital information. In fact, if you ask Cisco, we'll have passed the threshold of consuming over a zettabyte of information by the end of 2015. That's a billion terabytes. And with more of us opting to sack the 5.25" bay in favour of USB installs and a cleaner, tidier rig. It'll only be a matter of time until disks go the way of the dodo. Following floppy disks, LPs and photo albums into early retirement; reserved only for the hipsters and purists amongst us who still value a connectivity free world.

But ultimately, in this age of wonder, there's a terrifying fragility to all of the memories, music, files. and documents we hold dear. It's never been more important to run and maintain multiple backups. In this guide we'll show you how to ensure the continued security of your files from the inevitable monster that is file degradation, corruption. and general accident. –ZAK STOREY



Shrink D:

Total size before shrink in MB: 238473

Size of available shrink space in MB: 191473

Enter the amount of space to shrink in MB: 100000

Total size after shrink in MB: 138473

You cannot shrink a volume beyond the point where any unmovable files are located. See the "defrag" event in the Application log for detailed information about the operation when it has completed.

See "Shrink a basic volume" in Disk Management help for more information

1 PREPARING YOUR PC

The first thing you need to consider is, what do you want to back up and how are you going to secure those files against their inevitable demise? In our case we will be utilizing a Windows 10 operating system and the integrated Windows Backup feature. We'll be doing a simple backup of our C: drive and our documents and that's it. After all, Steam games are already safely secured in the cloud, ready to re-download.

2 THE PERKS OF HARD-DISK PARTITIONING

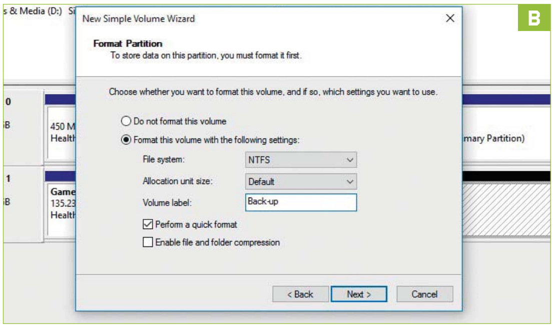
You should all be aware of creating hard disk partitions already. The general principle is pretty simple. Either through utilizing partitioning software or multiple hard drives you can keep your main OS on one partition and your games and other programs on another. Not only does this potentially protect you from some minor viral infections, but it also helps to keep your PC organized and easier to back-up as well.

3 SHRINKING A HARD-DISK PARTITION.

To shrink or create a hard-disk partition, click the Start menu then type "partition". Windows should bring up a program that says "Create and format hard disk partitions". Once in here you can format a new drive, or shrink an existing one. In our case, we're going to shrink our games drive by 100GB to create space for our new backup partition. Right click on your chosen drive or partition and select shrink volume. Then input in megabytes how big you want your new partition to be, and select Shrink [**Image A**].

4 CREATING A HARD-DISK PARTITION.

Once you've successfully shrunk your hard drive, right click the black "Unallocated" space and select "New Simple Volume". Hit Next, and then input how many MB you want your new volume to be, then hit Next again. Here you can assign the drive a letter (from A-Z) and hit Next again. At this point you want to keep the file system as NTFS, the Allocation Unit Size as Default and then give it a



New Simple Volume Wizard

Format Partition
To store data on this partition, you must format it first.

Choose whether you want to format this volume, and if so, which settings you want to use.

○ Do not format this volume
● Format this volume with the following settings:

File system: NTFS
Allocation unit size: Default
Volume label: Back-up

☑ Perform a quick format
☐ Enable file and folder compression

WHY IS IMAGE SO IMPORTANT?

Windows 7 System Image Backup is quite possibly one of Microsoft's best features. It allows enthusiasts a way of backing up and restoring systems effectively and quickly when they're prone to corruption or data loss. Particularly handy when running a RAID 0 (striped) environment. Even though SSD reliability has increased quite dramatically, you still don't want to be running a RAID 0 array without a back-up, especially if you're storing valuable information on it.

Microsoft removed Windows 7's backup feature from Windows 8.1, forcing users to go elsewhere for their backup solutions. This was particularly annoying considering its rationale for the removal of this feature was that if you had any OS problems, you could fix them with a simple USB media key or a Windows refresh. It's back in Win10.

label (such as "Backup"). If you're running an SSD, always select "Perform a quick format", then hit Next to finish [**Image B**].

5 SETTING UP WINDOWS BACKUP

Once you have your backup partition set up and formatted, click the Start menu, then "Settings," then "Update & Security." Once here select the third option down, "Backup." Once the new window opens you want to use the "Back up using File History" option. To do this, hit the add drive button, then select your new partition. Windows will now give you one tick box that says automatically backup my files. Click the More options link below. As you can see this will be backing up all of your individual personal files, such as music, photos and documents, but not a lot else, you can also choose how often you want it to backup your files.

6 SETTING UP AN IMAGE BACKUP

Although this is a great way to ensure you don't lose any cherished memories, if your operating system crashes it'll be less than helpful. While on the "Backup" page, select the "See advanced settings" link at the bottom of the new window. Then at the bottom left hand side of that window hit "System Image Backup."

7 WINDOWS 7 IMAGE BACKUP RETURNS!

Once here you'll want to select the "Set up back-up" option. Then it's simply a case of choosing which hard drive or partition you wish to save an entire backup of your OS to. Hit Next, and then decide what files you want to back-up. You'll create a System Image in this process.

8 SCHEDULING BACKUPS.

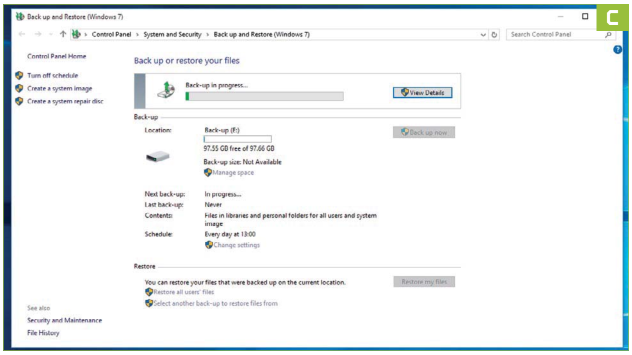
Once you've finalized what files you wish to backup, your next choice is to arrange a backup schedule. Your PC needs to be switched on for this backup to occur. Hit the "Change schedule" link and set when and how often you want to backup, then select "Save settings and run backup" and you're done [**Image C**].

9 ON-SITE SOLUTIONS

A popular solution today is to invest in either a Network Attached Storage device or a USB hard drive that you can plug directly into your router, the latter being less useful, but both provide an additional way of backing up your files to protect your systems and your digital life.

10 OFF-SITE SOLUTIONS

And finally there's the off-site solution. The infamous cloud. Uploading your backups to the cloud, whether they're personal files such as photos or documents or even entire operating systems is now entirely possible. Solutions such as Google Drive, Microsoft Onedrive, Dropbox, and Acronis are great examples of these.


C
Back up and Restore (Windows 7)
Control Panel › System and Security › Back up and Restore (Windows 7)
Search Control Panel
Control Panel Home
Turn off schedule
Create a system image
Create a system repair disc
View Details
Back up now
Manage space
Change settings
Restore my files
Restore all users' files
Select another back-up to restore files from
See also
Security and Maintenance
File History

Back up or restore your files

Back-up in progress...

Back-up

Location: Back-up (E:)

97.55 GB free of 97.66 GB

Back-up size: Not Available

Next back-up: In progress...

Last back-up: Never

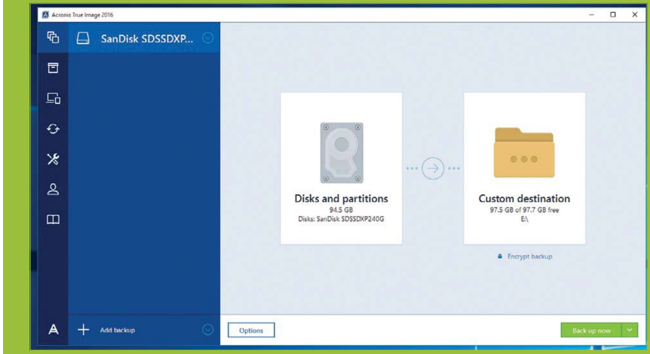
Contents: Files in libraries and personal folders for all users and system image

Schedule: Every day at 13:00

Restore

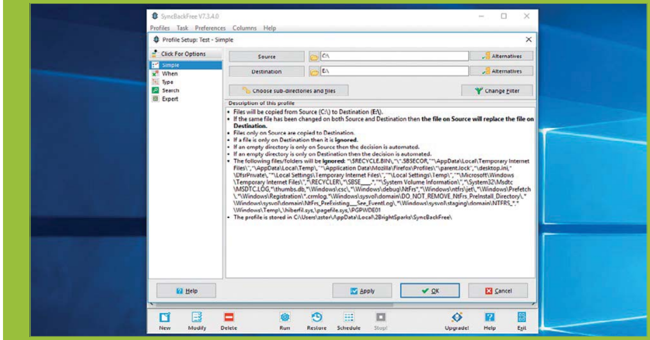
You can restore your files that were backed up on the current location.

BACKUP ALTERNATIVES


Acronis True Image 2016
SanDisk SDSSDXP...
Disks and partitions
94.5 GB
Disks: SanDisk SDSSDXP240G
Custom destination
97.5 GB of 97.7 GB free
E:\
Encrypt backup
Add backup
Options
Back up now

1. ACRONIS SOFTWARE

If you're looking for an alternative premium backup solution Acronis might be the one for you. Although it comes at quite the monthly cost, Acronis provides its customers with online cloud storage and syncing across multiple devices, providing of course your connection speeds are viable.


SyncBackFree V7.3.4.0
Profiles
Task
Preferences
Columns
Help
Profile Setup: Test - Simple
Click For Options
Simple
When
Type
Search
Expert
Source
Destination
Alternatives
Alternatives
Choose sub-directories and files
Change Filter
Help
Apply
OK
Cancel
New
Modify
Delete
Run
Restore
Schedule
Stop!
Upgrade!
Help
Exit

Source: C:\

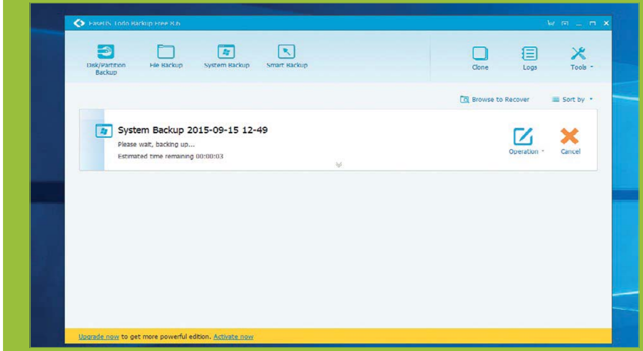
Destination: E:\

Description of this profile

- Files will be copied from Source (C:\) to Destination (E:\).
- If the same file has been changed on both Source and Destination then **the file on Source will replace the file on Destination.**
- Files only on Source are copied to Destination.
- If a file is only on Destination then it is **ignored**.
- If an empty directory is only on Source then the decision is automated.
- If an empty directory is only on Destination then the decision is automated.
- The following files/folders will be **ignored**: "\$RECYCLE.BIN\","*.SBSECOR,"*\AppData\Local\Temporary Internet Files\","\AppData\Local\Temp\","\Application Data\Mozilla\Firefox\Profiles\*\parent.lock","\desktop.ini," \DfsrPrivate\,"*\Local Settings\Temporary Internet Files\","*\Local Settings\Temp\","*\Microsoft\Windows \Temporary Internet Files\","\RECYCLER\,"\SBSE___.*","*\System Volume Information\","\System32\Msdtc \MSDTC.LOG,"\thumbs.db,"\Windows\csc\,"\Windows\debug\NtFrs*,"\Windows\ntfrs\jet\,"\Windows\Prefetch \,"\Windows\Registration\*.crmlog,"\Windows\sysvol\domain\DO_NOT_REMOVE_NtFrs_PreInstall_Directory\,* \Windows\sysvol\domain\NtFrs_PreExisting\___See_EventLog\,"\Windows\sysvol\staging\domain\NTFRS_*.* \Windows\Temp\,\hiberfil.sys,\pagefile.sys,\PGPWDE01
- The profile is stored in C:\Users\zstor\AppData\Local\2BrightSparks\SyncBackFree\

2. SYNC BACK FREE

If you're feeling a little bit on the cheap side and don't fancy forking out for paid backup software Sync Back Free might be the solution for you. Although it's free and comes with a rather clunky interface, a massive perk is the fact that it does not use a proprietary format. Ideal for backing up media files, it also doesn't create any bootable media or system image files.


EaseUS Todo Backup Free 8.6
Disk/Partition Backup
File Backup
System Backup
Smart Backup
Clone
Logs
Tools
Browse to Recover
Sort by
Operation
Cancel

System Backup 2015-09-15 12-49

Please wait, backing up...

Estimated time remaining 00:00:03

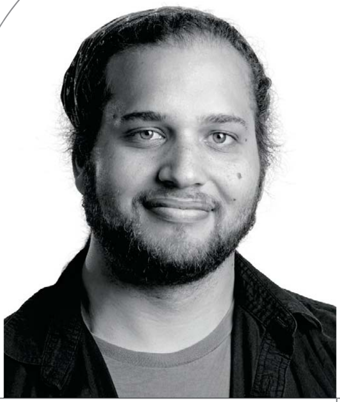
Upgrade now to get more powerful edition. Activate now

3. EASEUS TODO BACKUP FREE

As the name implies EaseUS is another free alternative. Providing both free and premium products, EaseUS can create backups of your entire system and comes with a user friendly interface layout, with enough features for the hardened tech junkie.

BUILD IT

ALEX CAMPBELL **ASSOCIATE EDITOR**



What Gloriousness Really Looks Like

A build based on a poll published by reddit.com/r/PCMasterRace

LENGTH OF TIME: **1½ HOURS** | LEVEL OF DIFFICULTY: **EASY**

THE MISSION

THERE ARE PLENTY of places on the web where PC enthusiasts congregate. Countless forums, social media accounts, and blogs abound with folks showing off their PC builds and talking about hardware. You'd better believe www.reddit.com/r/PCMasterRace is one such place .

Even though the words "Master Race" may make some uneasy (and for very good reason), you can rest assured the vast majority of the subreddit's members are just PC enthusiasts who love to build and use PCs. The subreddit derives the name from the belief that PCs are inherently superior to consoles. In many ways, we can get behind that idea. The forum is full of stories about console users ascending to join the ranks of PC users.

The thing is, the title "Master Race" may suggest that all the members of such a forum have high-end PCs that would warp space-time or have conveyor belts that make bacon grilled cheese sandwiches all day. As it turns out, this isn't always the case—though if someone has a PC that has a grilled cheese maker built into it, we want to see it yesterday.

We found an infographic posted on the subreddit that was based on a poll of the members of PCMR. The infographic showed the percentage of users who used different kinds of parts, e.g., air versus water cooling, and a host of other specs. We thought it would be interesting to find out what the "master race" rig actually looked like, so we set out to build one based on the most common features, as described by the infographic.

A MASTER CASE FOR THE MASTER RACE

ONE THING WE NOTICED when we set out to build our PCMR machine was that the common specs are strikingly similar to the recommended specs for Oculus Rift. As a result, we were able to reuse some of the parts Jarred used for his Oculus Rift build in our September issue. We plucked the short Asus GTX 970 and ASRock Z97 mobo out of that build and put together a rig using parts from around our lab.

One of the new impressive pieces of gear that went into the build was Cooler Master's conveniently named Master Case 5. This midtower case is fully modular, and most elements come off with an easy-to-reach tab or thumb screw. We also have a box full of "extras" for the case, but we decided to stick with the "stock" version. The parts we chose all fit well within the midtower chassis, without overdue effort from us.

For the brains of this build, we went with the Core i5-4590, which is also the recommended CPU for Oculus Rift. For memory, we pulled the two Patriot Viper 3 DDR3 modules from last month's upgrade build and pressed them back into service.

INGREDIENTS

PART		STREET PRICE
CPU	Intel Core i5-4590	$200
Motherboard	ASRock Z97	$170
GPU	Asus GTX 970 DCMOC	$355
Memory	Patriot Viper 3 8GB DDR3 1600	$50
PSU	EVGA Nex750G 80 Plus Gold	$105
Case	Cooler Master Master Case 5 Midtower	$109
HDD	WD Black 1TB	$71
SSD	Samsung 850 EVO M.2 250GB	$109
Fan	3x Corsair AF140 White	$51
Total		$1,220

1 PLUS FIVE INTELLIGENCE

WHEN IT COMES TO CPUS, PCMR is pretty damned clear about what the preferred chips are. Eighty percent of PCMR builds use Intel processors. The survey also broke down what the preferred processor lines were. The subreddit chose the Core i5, with 41.1 percent of the vote, over the Core i7 (32.4 percent) and AMD FX (13.1 percent). Only 36.3 percent of ascended members overclocked.

We chose the Core i5-4590 as our CPU. While it's not unlocked, this quad-core has plenty of power for most applications. The CPU is also fairly inexpensive, and coupled with a Z97 board, allows for future upgrades.

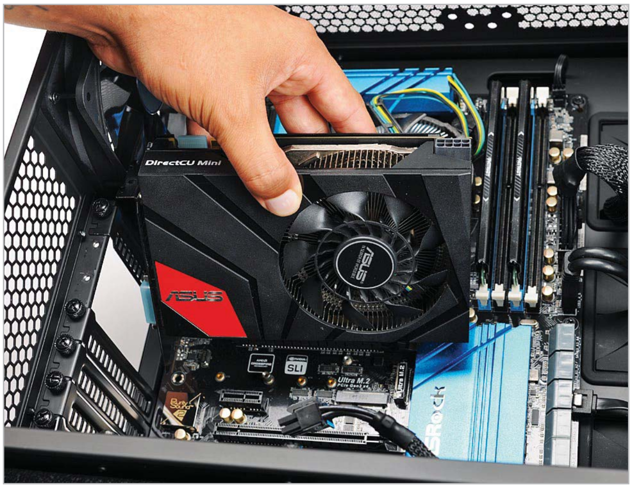
A quick look at Intel ARK reveals that the 4590 is made with conflict-free materials. That little added bonus means that this CPU, while less beefy than its bigger cousins, can give you the warm fuzzies while you blast your foes to bits with a rocket launcher.

INTEL CORE™ i5-4590
SR1QJ 3.30GHZ
VIETNAM
X507C088

2 HEART OF A WARRIOR

WHEN THE PCMR flexes its muscles, it prefers green to red by a wide margin. Nvidia claimed 67.7 percent of the vote while AMD only clutched 28.9 percent. Intel's integrated graphics made a small showing with 3.4 percent of the vote.

Most respondents also preferred a "high-end" videocard (one that costs between $300 and $500). The short version of the GTX 970 by Asus that we chose falls squarely in that price range at $355. We left the GPU at stock clocks too, as only 38 percent of the ascended said they overclocked their GPU. Even if we had overclocked the GPU, this little card had plenty of room to breathe in this case. Nvidia's next step up, the GTX 980, falls into the survey's "flagship" category at $550.



3

NEVER FORGET

WHEN WE LOOKED at what PCMR members used for storage solutions, we found that 55 percent do the same thing we do in most of our builds: use an SSD for the OS and apps and regulate media files and other storage to spinning hard drives.

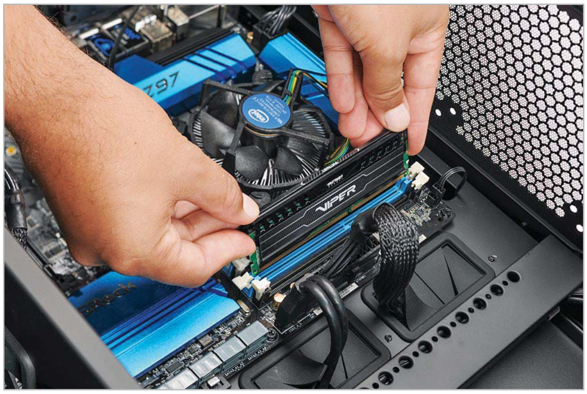
For our SSD, we went with an M.2 version of the Samsung 850 EVO. The read and write performance of the M.2 model is about the same as the SATA version, as is the price at a little over $100. This particular motherboard had two M.2 slots to fill, so we figured: hey, why not? For the spinning drive, the 1TB WD Black gives us enough archive space to start out with at a decent price ($71). The flexibility of the Master Case lets us put the drive almost anywhere forward of the motherboard, but we opted to keep it at the bottom of the mounting rail to optimize airflow to the CPU and GPU.

4

ADVANCED MENTAL CAPACITY

MEMORY IS ONE OF THOSE THINGS that can differ greatly depending on the application of the machine. Games tend to not need a whole lot of RAM, but big data-heavy design applications do. When it comes to the ranks of the PCMR, about half (51.3 percent) of users only need 8GB of RAM. Meanwhile, 33.7 percent made the jump to 16GB.

The overwhelming majority use DDR3. The RAM data gave us another interesting insight: Since only a small minority of respondents (9 percent) are using DDR4, we can derive that not a whole lot of people are sporting X99 Haswell-E systems. We love our Haswell-E systems here in our lab, but in the wild, they're clearly not as widespread.



5

THE SOURCE OF POWER

TO KEEP THINGS COOL, a case needs air flow. With the Master Case, the included single 140mm front case fan just didn't cut it with us. We replaced the single fan with a trio of Corsair's AF140 white LED fans.

We tend to go with closed-loop water cooling to chill out our CPUs for overclocking, but it turns out only 36.3 percent of PCMR overclock their CPUs, and nearly 70 percent use air cooling. That let us justify keeping Intel's stock CPU fan, while also pushing a bunch of air through the case.

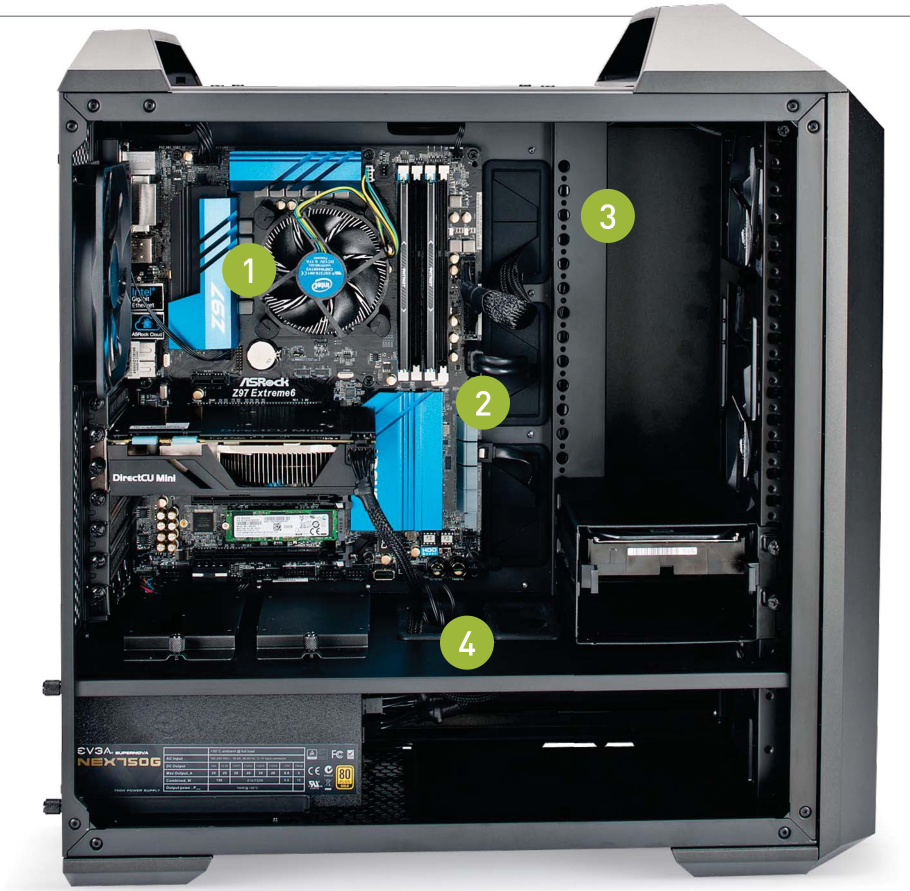
The ASRock Z97 Extreme has four PWM case fan pinouts. We stacked the three fans up front to push a wall of air toward the GPU, CPU, memory, and mobo. The stock side panel of the Master Case lacks a window, which means that the three fans won't create too-big glowy light leaks.

6

CABLE NIGHTMARE

IMMEDIATELY OBVIOUS with this case was the utter lack of cable management. In terms of PC cabling, this is the stuff of nightmares. What seems like an obvious route for cables—over the horizontal rail and behind the drive bays—is made impossible by a side panel that has an inward (inward!) bevel. When we tried to keep cabling tucked behind the mobo tray, we felt like the case was making fun of us. "Oh, that's cute," it would say. "I bet you'd just love an extra centimeter. Tough luck."

Coupled with the woefully insufficient zip ties that came with the PSU, this cable job could have you waking up in cold sweats. We had to stuff the cables behind the drive cage, doing our best to keep them out of the way of the front fan's air flow. The wiring still looks like a mess.



1. Using a Z97 board is a bit overkill for the locked i5-4590 we chose for our CPU. However, using a Z97 board opens the door for future upgrades to K-model CPUs.
2. The Master Case 5 only has USB 3.0 ports on the front panel, so there was no need to snake USB 2.0 connections to other parts of the board.
3. Since the Master Case 5's drive bays are fully modular, we removed the front-facing 5.25-inch cage to improve air flow.
4. Having cable passthroughs with rubber grommets on the case's horizontal partition helps keep unsightly cross-motherboard cable reaches to a minimum.

ASCENSION

WHEN IT COMES RIGHT DOWN TO IT, gaming PCs come in all calibers. To members and readers of /r/PCMasterRace, the most important thing is to prefer gaming on the PC to gaming on a console. As we found out, that PC doesn't need to be a Dream Machine.

Even though the average PCMR specs are modest compared to the stuff we usually build and review, the i5-4590 is still a good CPU. While we often use the GTX 980 as the yardstick by which to judge other GPUs, the GTX 970 is still plenty powerful, and offers great performance for the price.

When it comes to the time, single-threaded benchmark tests, the Core i5-4590 wasn't far behind the Core i7-5960X. Considering that the i5-4590 is only a fifth of the price of the 5960X, its performance is actually quite impressive.

Once we ran our multithreaded x264 benchmark, the octa-core 5960X left the little quad-core 4590 in the dust. While you can cut, slice, and encode video, we'd definitely go for a hexa-core CPU if you have the budget for it. Even if you can't go that high, the clocks of an i7-4790K Devil's Canyon will get things done much quicker than the i5 can.

Since we transplanted the GTX 970 from last month's upgrade build, our video benchmarks remained about the same. A single GTX 970 versus three 980s in SLI isn't really a fair fight in any sense of the term, but that doesn't mean that the 970 is a weakling. The GTX 970 performs well at 1440p, and is the recommended GPU for Oculus Rift.

Audiophiles make up a minority of the PCMR, since only about 21 percent of respondents used a sound card (10.7 percent), digital-to-analog converter (8.5 percent), or a digital audio workstation-grade setup (1.8 percent). About 79 percent settled for onboard audio, so we did, too. This time.

Building a PC can be intimidating. Helping others with their first rig is a chance to help spread the joy of building PCs. After all, we've all had our moments of peasantry where we break down and play a game or two in the living room, too, console controller in hand. But for PC enthusiasts, a mouse, keyboard, and a wicked-fast and sharp gaming experience will always reign supreme.

BENCHMARKS

	ZERO-POINT	
Stitch.Efx 2.0 (sec)	806	871 (-8%)
ProShow Producer 5.0 (sec)	1,472	1,554 (-5.6%)
x264 HD 5.0 (fps)	33.8	13.52 (-60%)
Batman: Arkham City 1440p (fps)	204	72 (-64.7%)
Tomb Raider 2160p (fps)	87.5	28.3 (-67.7%)
Shadow of Mordor 2160p (fps)	70.1	30.6 (-56.3%)
3DMark FireStrike Ultra	8,016	2,479 (-69.1%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our desktop zero-point PC uses a 5960X CPU, three GTX 980s, and 16GB of RAM. *Arkham City* tested at 2560x1440 max settings with PhysX off; *Tomb Raider* tested at Ultimate settings; *Shadow of Mordor* at Max settings.

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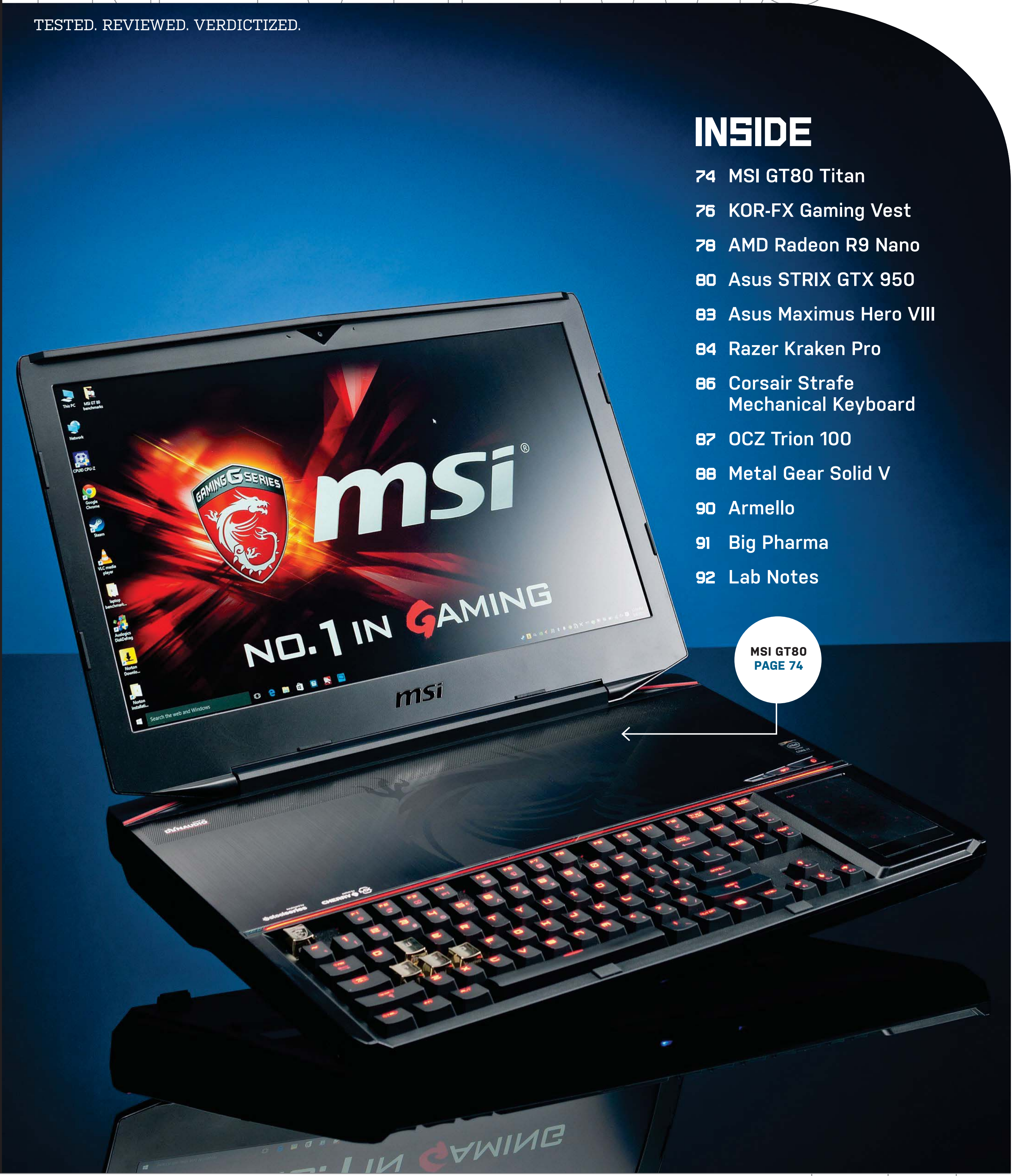
REVIEWS

TESTED. REVIEWED. VERDICTIZED.



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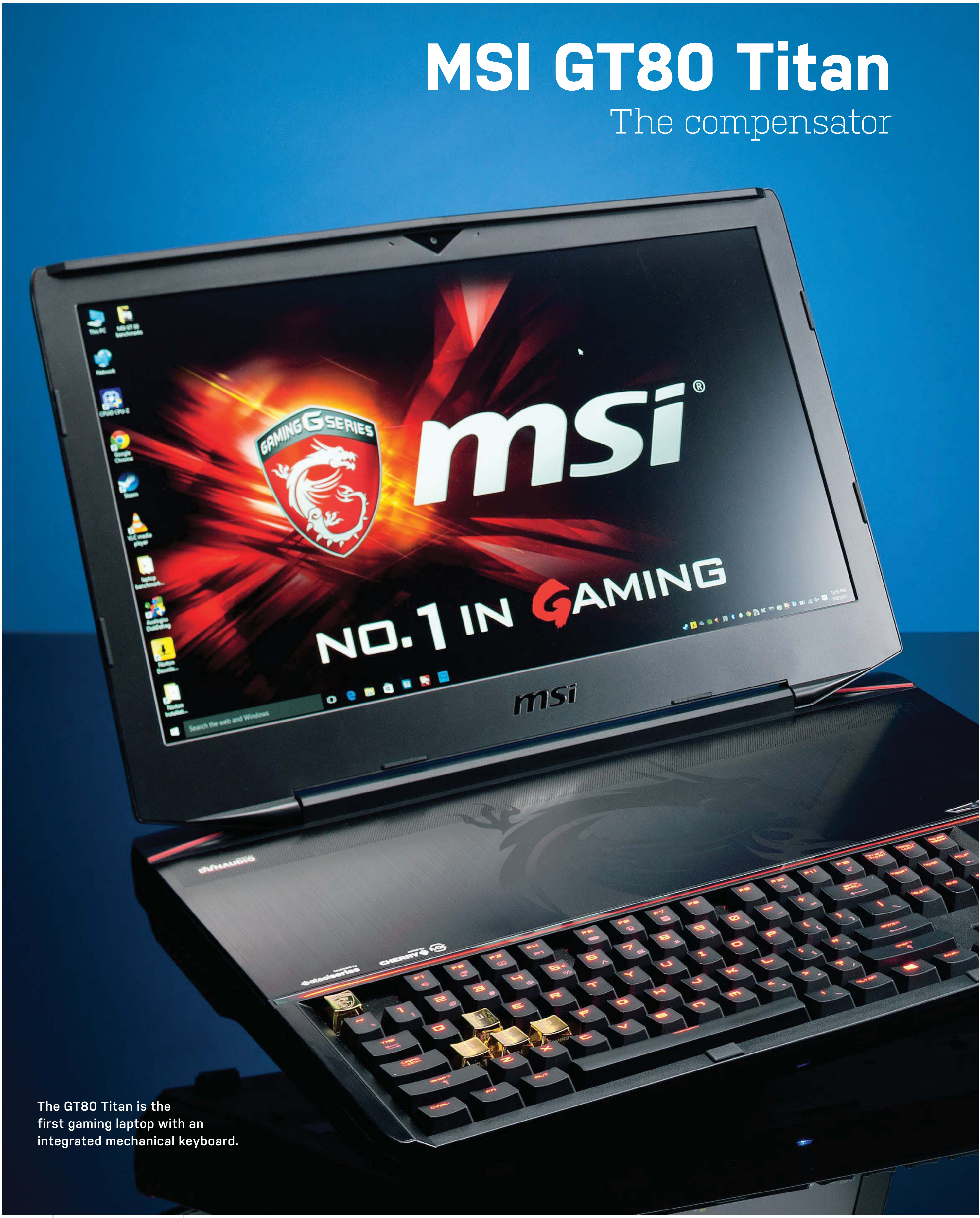
MSI GT80 Titan

The compensator



The GT80 Titan is the first gaming laptop with an integrated mechanical keyboard.

WE'VE BEEN asked more than a few times why there aren't any gaming laptops with mechanical keyboards, and up until now our response has always been, "Because that would be stupid." MSI has thrown convention out of the window by introducing its GT80 Titan, the world's first gaming laptop with an integrated mechanical keyboard, and slap us on our butts and call us Sally if it doesn't work in its own little, or shall we say, big, way.

Specifically, the GT80 Titan uses a tenkeyless keyboard designed by SteelSeries, outfitted with Cherry MX Brown switches and red LED backlighting. Overall, it looks and feels surprisingly great. The Brown switches offer a nice sense of tactility without being too noisy. MSI has integrated its trackpad on the right-hand side, sort of like what Razer did with its Razer Blade 17-inch laptop. This placement is a little awkward, but you'll get used to it eventually. And by holding down on the num lock key, the trackpad doubles as a numpad, which is kind of neat.

The keyboard and trackpad aren't the only unique features of the laptop. The GT80 Titan also features two GeForce GTX 980Ms. These two mobile GPUs easily beat a desktop 980, and interestingly enough, a single 980M has 6GB of VRAM vs. the desktop equivalent's 4GB. The 980Ms here feature core clocks of 1,030MHz, memory clocks of 1,253MHz, and boost clocks of 1,127MHz. The laptop also features a Haswell i7-4720HQ CPU that's clocked at 2.6GHz (with a boost clock of 3.6GHz). To go along with the quad-core/eight-thread CPU is 16GB of DDR3 RAM. Storage-wise, the laptop rocks 256GB of SSD storage in RAID 0, and it has a 1TB HDD, too.

All of this is housed in the large bay above the keyboard. While laptops generally aren't too modular, the GT80 Titan allows you to access this bay to swap out its storage drives, RAM, and even its MXM GPUs. In regard to the chassis itself, the GT80 Titan features a plethora of features and ports. There's basically everything you need here to act as your desktop replacement. While its panel isn't likely to be as big as your favorite standalone monitor, its 18.4 inch screen is big for a laptop. It has great colors and fantastic viewing angles. There is no touchscreen, however, which definitely would have been nice to have.

Our biggest gripe with the screen, however, is that it's a 1080p panel. With all that firepower, you'd think MSI would include either a 3K or 4K display. Even a 2560x1440 panel would make more sense.

The GT80 sounds really good. The speakers are by Dynaudio and the laptop even has a subwoofer on the bottom; you'll get plenty of volume. The laptop also has two unique buttons: one that allows you to switch between integrated and discrete graphics, and one to enable "cooler boost," which basically pushes the fans to a really loud 100 percent power.

Luckily, the graphics cards perform like champs without enabling tornado mode to keep things cool. Seriously, the GT80 Titan obliterated our Alienware's 765M GPU by a performance delta of 260–360 percent. With its 1080p panel, you can max out every single game out now with silky smooth frame rates. It's actually way overkill for 1080p. CPU performance wasn't nearly as killer—its processor performed about as well as any modern gaming laptop's i7 would. We saw a 4 percent improvement boost in our x264 benchmark compared to our ZP, where the GT80's extra 200MHz headroom allowed it to eke out a win.

Somehow, MSI was able to judo the laptop's weaknesses into its greatest strengths. Sure, the mechanical keyboard bloats up the chassis, but you're getting larger-than-life power out of this bad boy as a result. Overall, the design is kind of brilliant as a desktop replacement. At over $3,000, it is expensive as hell, but it also packs one hell of a punch.–**JIMMY THANG**

VERDICT
9

MSI GT80 Titan

⊞ **MECHANICAL KEYBOARD** Nice mechanical keyboard; easily serviceable; two 980Ms; great tech.

⊟ **MEMBRANE KEYBOARD** Big and heavy; expensive; disappointing 1080p screen resolution; poor battery life.

$3,300, www.msi.com

SPECIFICATIONS

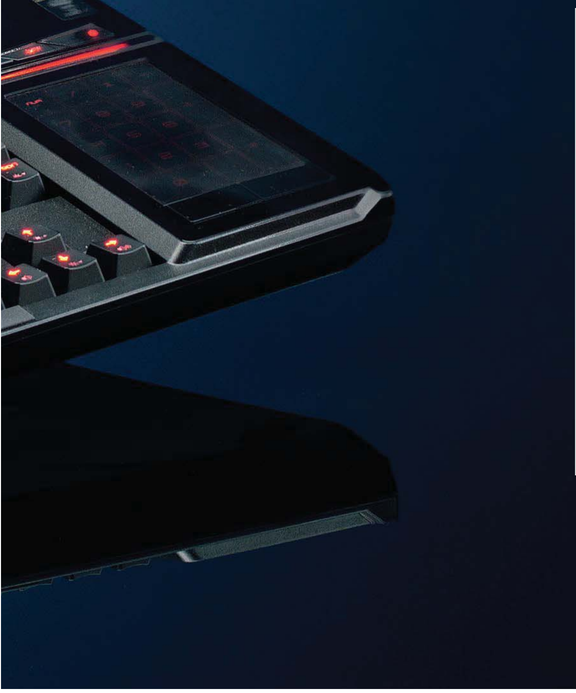
CPU	Intel 2.6GHz Core i7-4720HQ
RAM	16GB of DDR3/1600MHz
Chipset	Intel HM87
GPU	2x Nvidia GeForce GTX 980M
Display	18.4-inch, 1920x1080 display (matte)
Connectivity	5x USB 3.0, optical port, headset and mic port, SD card reader, optical drive, two Mini DisplayPorts, HDMI port, Ethernet port
Storage	256GB SSD, 1TB HDD
Weight (Lap / Carry)	10 lbs, 11.6 oz /13 lbs, 12.8 oz

BENCHMARKS

	ZERO-POINT	
Stitch.Efx 2.0 (sec)	962	970 (-0.8%)
Proshow Producer 5 (sec)	1,629	1,623 (0.4%)
x264 HD 5.0	13.5	13.85 (4.4%)
Bioshock Infinite (fps)	36.1	14.1 (362%)
Metro Last Light (fps)	30.4	166.8 (258.6%)
3DMark 11 Perf	4,170	15,672 (275.8%)
Battery Life (min)	234	126 (-46.1%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our zero-point notebook is an Alienware 14 with a 2.4GHz Intel Core i7-4700MQ, 16GB DDR3-1600, 256GB mSATA SSD, 750GB 5,400rpm HDD, GeForce GTX 765M, and Windows 7 Home Premium 64-bit. *BioShock Infinite* tested at 1920x1080 at Ultra DX11 settings; *Metro: Last Light* tested at 1920x1080 at DX11 medium quality settings with PhysX disabled.



Batteries, gun, helmet, and Jimmy Thang sold separately.

KOR
FX
KOR-FX

Kor-FX Gaming Vest

It's a Rumble Pak... for your body

IN AN ATTEMPT to make gaming more immersive, Nintendo introduced the Rumble Pak for the N64 way back in 1997. Kickstarter-funded company Immerz hopes to up the ante, and the feedback, with its Kor-FX "immersive gaming vest."

Put simply, it converts acoustic signals into haptic feedback. Two vibrating transducers are located in the chest region, spaced roughly ear-distance apart. The theory is that, when you talk, most of the vibration comes from within your chest. Thus, the internal vibrations are what the vest is trying to emulate.

The vest itself is relatively comfy, though with any gaming peripheral that you have to wear, it's a slight hassle to put it on. You'll also look extremely dorky wearing it. Luckily, it fits a wide variety of body types with its two Velcro straps. We really liked that the vest is wireless, but we didn't like that the four AA batteries needed to power it weren't included. The vest syncs up to your PC via a square-ish dongle that measures roughly 3x2 inches. This dongle blasts out an RF signal to the vest and hooks up to the computer via a Mini-USB cable. The dongle can also be powered by four AA batteries, if you want to go down the completely wireless route.

Setup is simple enough. Once you've got the dongle powered, you simply plug in a 3.5mm auxiliary cable (included) from the dongle into your PC's audio jack. From here, you can plug your analog headset into the dongle. And that's largely it. There's no software or driver, but that doesn't mean you can't customize the experience, as the vest has several physical buttons on it—two on the left that allow you to adjust the intensity of the vibrations, while on the right are buttons to turn on the vest, pair the vest with the dongle, and different sensitivity presets. Immerz admits that the differences between presets are extremely subtle, and we couldn't really feel any difference between them.

GOOD VIBRATIONS

When wearing the vest, the closest analogy we can use is that of the sensation you get when you're sitting in a movie theater with some kick-ass speakers, and a loud explosion goes off. The thunderous vibrations make you feel somewhat connected to the experience. Explosions and firing a machine gun in an intense first-person shooter with the vest feels good for the most part, and contributes to the sensation that you're in the thick of the action. Our favorite moment thus far has been trying to defuse a bomb in *Counter Strike: GO*, only to have the bomb explode. It gives the game a slightly higher sense of intensity, and we suspect some people will really get a kick out of it.

That's not to say that the experience is perfect. Because it simply converts audio to vibrations, you'll sometimes feel vibrations when you shouldn't. Music, footstep noises, and, to a lesser extent, dialog, can trigger unwanted haptic feedback, for instance. You can mitigate this somewhat by disabling music in games that allow for it. Ideally, there would be different presets tailored toward specific games, and Immerz tells us it's working on that. The jury is still out on how well that will work, however. The two transducers are also a bit limiting. For instance, getting shot in the back in an FPS will trigger vibrations on the front of the vest. We would have also appreciated it if you could crank up the vibrations a bit.

Another gripe is that the dongle only takes in analog headsets. Immerz says it's working on an optical line in, but the company has no plans to incorporate USB headsets, because of the challenges those pose with their independent soundcards. While understandable, it's kind of a shame, considering most wireless headsets use USB. Finally, Immerz says there are interference possibilities with home Wi-Fi—but we didn't experience any.

Do you really need the Kor-FX vest? No. Does it make game experiences more immersive? Possibly. It can make firefights more intense. It can also make you jump out of your seat in scary games a little more, too. Where we see it making the biggest impact, however, is with VR; here, it could add a sense of tactility to what has otherwise been a non-tactile world. But due to its imperfections, we can only really recommend the vest to the hardest of the hardcore. **–JIMMY THANG**

VERDICT 7

Kor-FX Gaming Vest

➕ **RUMBLE PAK** Makes first-person firefights more intense; relatively easy to set up.

➖ **DUALSHOCK** Acoustics-to-haptics system is wonky; no USB headset support.

$150, www.korfx.com

AMD Radeon R9 Nano

Fiji gets downsized and goes places no GPU has gone before

AMD
RADEON
GRAPHICS
RADEON
AMD

The R9 Nano is a Mini-ITX builder's dream come true.

IF THE NAME didn't give it away, the AMD Radeon R9 Nano is positively tiny—it's about as short as you can make a graphics card while providing a full x16 PCIe connection. AMD's engineering team looked at its shiny new Fiji architecture and decided to see how small a graphics card could be. The result is a card that measures just six inches; the closest contender to the Nano is the GTX 970 Mini: half an inch longer and far off the pace when it comes to performance.

What's truly impressive isn't just the size, however. AMD reduced the TDP by 100W compared to Fury X and only had to give up 150–200MHz in the process (the GPU will throttle to stay under the TDP). Nano moves to a single 8-pin PEG connector and has fewer VRM phases, but otherwise the Nano is the same core hardware as Fury X. That means the limitations of Fury X like 4GB HBM are still present, but you get the full 4,096 graphics cores. The full gamut of cores mean there are even times where Nano is able to match or exceed the performance of the R9 Fury, which is typically going into cards nearly twice its size. This tiny terror packs a punch!

The Nano beats 390X by seven percent while using almost half the power, and it leads GTX 970 by 35 percent on average. It's also only four percent slower than the Fury and 12 percent slower than Fury X, and 20 percent slower than GTX 980 Ti. What's interesting is that the gap between Nano and Nvidia GPUs tends to increase at higher resolutions, e.g., at 1080p the Nano is only 25 percent faster than GTX 970, but at 4K it's over 40 percent faster. This despite having to further reduce clock speeds at higher resolutions. Nano is also slightly faster than the GTX 980, though the difference is basically the same as the power use.

Overclocking the Nano is possible, though total power is limited to around 225W and the card isn't designed to handle Fury X speeds. We ended up with a 35 percent increase in power target, six percent increase in core clock, and 10 percent increase to HBM clocks. These combined give us a pretty consistent 10-15 percent improvement in performance. That puts the overclocked Nano right around the level of stock Fury X, all while still using less power: a neat trick! But overclocking the R9 Nano goes against the design ethos of the card; anyone looking to seriously overclock their GPU would be better served by a different card—Nvidia's GTX 980 Ti remains the most compelling high-end overclocking GPU for now.

SIZE MATTERS

The Nano is an astounding GPU in many respects, and HBM is a big part of that—the area used for the GPU and GDDR5 on 980 Ti is more than twice that of the Fiji GPU and HBM package! There are a few caveats, however: Nano lacks HDMI 2.0 support, and the number of cases that are large enough for Nano but not large enough for 980 Ti is quite limited. Plus, if you don't care about small gaming rigs, the Nano looks rather impractical—just get a Fury X or GTX 980 Ti for the same price. It all comes down to personal preference.

Some people love muscle car GPUs, and larger GPUs are a better fit for them. Others look to squeeze every ounce of performance into the smallest space possible, and it's those running truly compact Mini-ITX rigs that will love the Nano. We think it's awesome, and we can't wait to see some of the outrageous mini-PC builds this will enable (see AMD's Project Quantum prototype). If you're interested in building a gaming PC with the highest performance per volume, a Mini-ITX system with R9 Nano makes for a nearly perfect match. **–JARRED WALTON**

VERDICT
9
KICK ASS!

AMD Radeon R9 Nano

+ CONDENSED MILK Compact; quiet; tiny; efficient; did we say small?

– SOUR MILK Expensive; not as fast as larger GPUs; 4GB VRAM; niche.

$649, www.amd.com

SPECIFICATIONS

GPU	Fiji
Lithography	28nm
Transistor Count	8.9 billion
Compute Units	64
Shaders	4,096
Texture Units	256
ROPs	64
Core Clock	Up to 1000MHz
Memory Capacity	4GB
Memory Clock	1,000MHz
Bus Width	4096-bit
Memory Bandwidth	512GB/s
TDP	175W

BENCHMARKS

	R9 Nano	GTX 980 Ti	R9 Fury X	R9 Fury	GTX 980	R9 390X	GTX 970
Batman: Arkham Origins	102 / 51	112 / 54	**114 /57**	108 / 54	85 / 42	90 / 44	67 / 32
Grand Theft Auto V	46 / 40	**58 / 49**	49 / 46	46 / 42	46 / 39	44 / 36	38 / 33
Hitman: Absolution	61 / 33	64 / 33	**67 / 36**	63 / 34	50 / 25	60 / 32	40 / 19
Metro: Last Light	61 / 33	**80 / 44**	70 / 39	64 / 35	67 / 36	57 / 29	51 / 26
Shadow of Mordor	74 / 42	**84 / 48**	81 / **48**	77 / 44	69 / 39	71 / 41	52 / 28
Tomb Raider	72 / 37	**91 / 45**	85 / 44	75 / 39	75 / 37	68 / 35	56 / 26
The Witcher 3	43 / 27	**53 / 32**	49 / 31	45 / 28	44 / 26	39 / 24	34 / 20
Seven Game Average	66 / 37	**77 / 44**	74 / 43	68 / 40	62 / 35	61 / 34	48 / 26

Best scores are bolded; results are average fps at 1440p/4K. Our test bed is a 4.2GHz overclocked Core i7-5930K in a Gigabyte GA-X99-UD4 motherboard, 4x 4GB DDR4-2666, 1TB Samsung 850 Pro, and EVGA SuperNOVA 1300W G2 running 64-bit Windows 8.1.

Asus STRIX GeForce GTX 950

Mainstream gamers rejoice

IF THERE'S ONE THING we love more than fast GPUs, it's affordable fast GPUs. The best-selling graphics cards of all time have generally come from the $150 sweet spot, and users looking to balance price and performance find skipping a couple of generations between upgrades is the way to go. You miss out on some features and performance, but even moderate hardware from a few years back can still run most games at 1080p with settings that look decent. Nvidia is going after these infrequent, mainstream upgraders with its latest Maxwell 2.0 card, the GTX 950.

Built on the same GM 206 core as the GTX 960, the 950 disables a couple of functional units and drops clock speeds a bit, all while reducing the price by nearly $50. In effect, the 950 ousts the GTX 750 Ti from the $150–$160 price point, pushing it down to $120. Unlike the first-generation cards, the 950 has all the latest Maxwell 2.0 features like MFAA, VXGI, and third-generation delta color compression. It does require a six-pin PEG connector, thanks to its 90W TDP, but it has plenty of overclocking headroom—which

Asus puts to good use by providing an 11–14 percent factory overclock.

Three generations of graphics hardware is like 21 dog years, and a lot can change during that time. We dug out an old GTX 650 for comparison; the 950 has twice the number of cores, more memory, and more bandwidth. The result is a huge jump in performance. Depending on the game and settings, the GTX 950 is anywhere from 2.5x to over 3.5x faster. Perhaps more importantly, where the GTX 650 struggles with our 1080p High settings, the Asus STRIX GTX 950 is able to break 30fps in nearly every title at 1080p Ultra, and it usually delivers more than 60fps at 1080p High (the exception in both cases being The Witcher 3, which is a beast to run).

Nvidia's GeForce Experience also received some recent additions, namely a new remote GameStream feature that allows co-op support, and latency-optimized settings for popular MOBA games. If you don't like juggling settings to figure out a good compromise on performance versus image quality, GFE does the dirty work for you and continues to be a slick solution for game settings and driver updates.

THE BIGGER PICTURE

If there are problems with the 950, they are the target launch price of $159 and the close proximity to faster GPUs. The GTX 960 is $199 MSRP, but some cards are selling for $180. The Asus GTX 950 MSRP is $169, narrowing the price gap even further, though we're seeing $10 rebates on many GTX 950 cards. Considering GTX 960 is around 15 percent faster than GTX 950, and R9 380 4GB is about 20 percent faster (with a higher TDP), you basically get what you pay for. Note that 4GB does make a big difference in certain titles (e.g., Shadow of Mordor at Ultra settings), which is something else to consider. The 750 Ti remains Nvidia's fastest sub-75W GPU, but the GTX 950 is around 50 percent faster, so we'd give the 750 Ti a pass now.

The GPU manufacturers have been stuck on 28nm for so long that it's a wonder we're still getting performance increases. Next year, 16nm FinFET GPUs should finally show up, with potentially double the transistor counts and performance of the current 28nm parts. But playing the waiting game isn't any fun. The GTX 950 is likely to hold the $150 gaming crown until then, and it's basically greater than or equal to the performance you'd get out of a current Xbox One or PS4 at half the cost (plus PC games are generally less expensive). If you're hanging onto a mainstream GPU like the GTX 650, or you have any moderately recent PC that you want to turn into a gaming-capable system, treat yourself to a GTX 950 and you won't be disappointed. **–JARRED WALTON**

VERDICT
9

Asus STRIX GeForce GTX 950

+ MAXWELL ROCKATANSKY Affordable; 1080p gaming ready; energy efficient.

− SCABROUS SCROTUS Six-pin connector; 2GB VRAM; GTX 960 isn't much more.

$159, www.asus.com

SPECIFICATIONS

GPU	GM206
Lithography	28nm
Transistor Count (billions)	2.9
SMM/SMX	6
Shaders	768
Texture Units	48
ROPs	32
Core Clock (MHz)	1,140
Boost Clock (MHz)	1,329
Memory Capacity	2GB
Memory Clock (GT/s)	6,600
Bus Width (bits)	128
Memory Bandwidth (GB/s)	106
TDP (watts)	90

BENCHMARKS

	GTX 960 2GB	GTX 950 2GB	GTX 650 1GB	R9 380 4GB	R9 285 2GB
Batman: Arkham Origins	**129** / 76	108 / 75	45 /32	117 / **86**	113 / 83
Grand Theft Auto V	**106 / 40**	92 / 34	33 / 10	101 / 39	96 / 34
Hitman: Absolution	83 / 40	74 / 36	29 / 16	**85 / 50**	85 / 48
Metro: Last Light	**69 / 58**	59 / 49	21 / 17	65 / 52	63 / 50
Middle-earth: Shadow of Mordor	69 / 40	60 / 39	23 / 15	**81 / 61**	78 / 46
Tomb Raider	121 / **63**	106 / 52	42 / 17	**143 / 63**	139 / 59
The Witcher 3	47 / 33	39 / 26	11 / 6	**48 / 34**	46 / 32
Seven Game Average	89 / 50	77/ 45	29 / 16	**91 / 55**	88 / 50

Best scores are bolded. Results are average fps at 1080p High/Ultra. Our test bed is a 4.2GHz overclocked Core i7-5930K in a Gigabyte GA-X99-UD4 motherboard, 4x 4GB DDR4-2666, and an EVGA SuperNOVA 1,300W G2 power supply. The OS is 64-bit Windows 8.1. Graphics drivers are Nvidia 355.82 and AMD Catalyst 15.8.1.

Asus's STRIX GTX 950 aims for the $150 GPU crown.

Future

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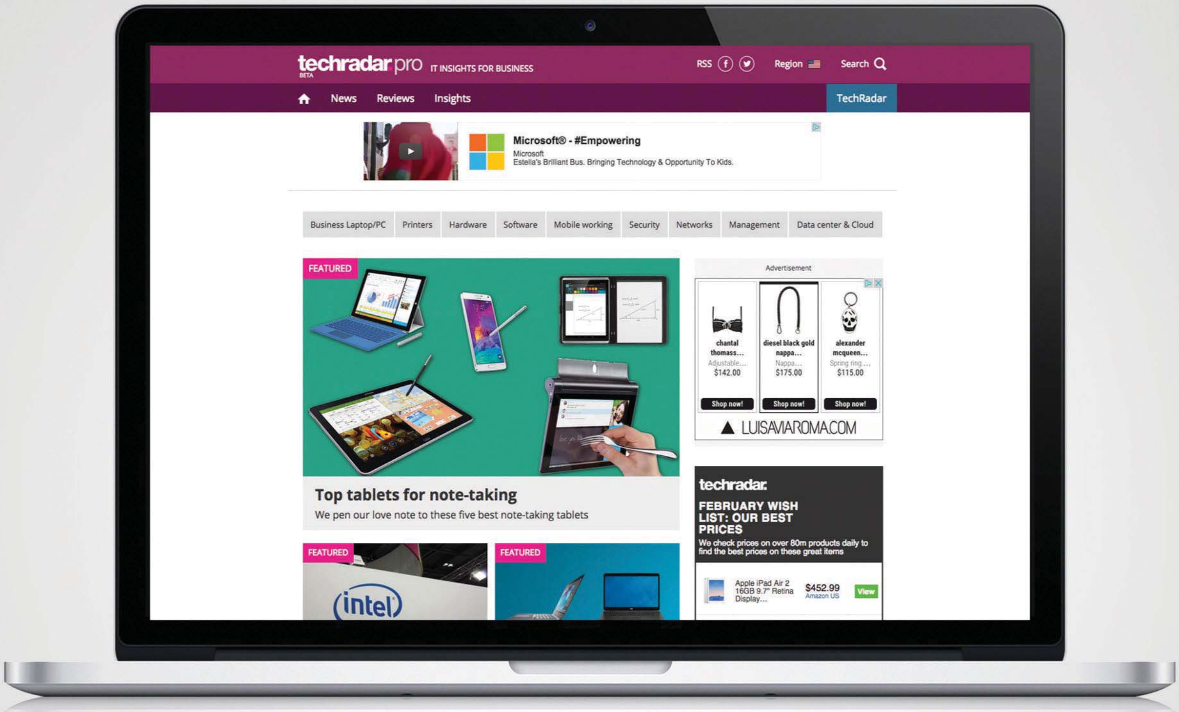
IT INSIGHTS FOR BUSINESS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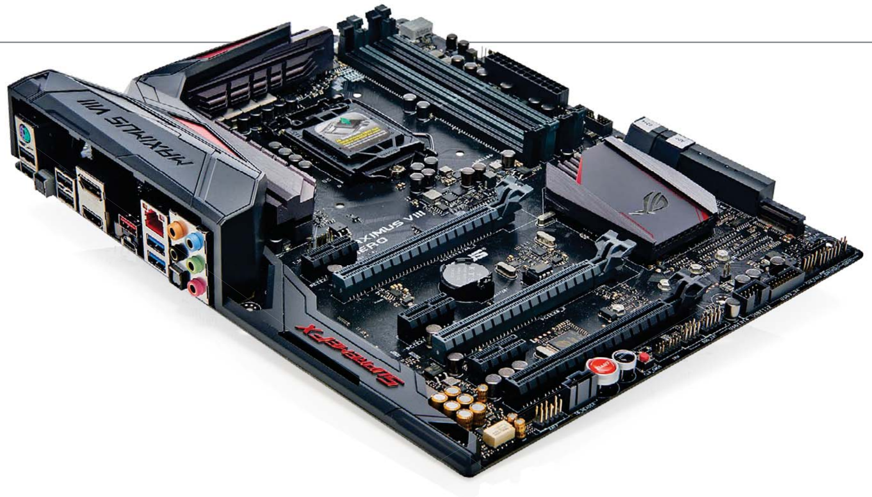
Asus Maximus VIII Hero



Pretty, stylish, not very red

ASUS, REPUBLIC OF GAMERS. It's a coveted name. A brand that's shifted from premium products to a more encompassing mobo and graphical solutions line, and now appears to be a convergence of the two. The color red has always followed RoG, so it's also interesting to note that Asus has moved from its usual design style, in favour of something a little more subtle.

The Maximus VIII Hero turns up somewhere in the middle of Asus's eighth iteration of Maximus motherboards, with the first Hero being introduced way back with Haswell and the Z87 chipset. The launch of the first Hero marked RoG's entry to the mainstream, a move that pulled most of its high-end expertise into the more consumer-grade marketplace. The Hero became the quintessential mobo of choice, a board ideal for any PC gamer looking to build a clean, decent-looking rig. So, has this changed? Yes, yes it has.

As far as feature sets go, you get the traditional selection of high-end on-board audio components alongside Asus's Sonic Studio II; you get Intel's gigabit networking solution; and you get all of the perks found in AI Suite III for cooling and overclocking. More intriguing, however, is the inclusion of a new and improved RAM cache.

Traditionally, RAM disk software hasn't massively helped PC gamers gain any edge or speed over their rivals. This is mostly down to how the software operates, usually only allowing temporary internet cache files or scratch disk files to be created, stored and deleted (as, after all, RAM is volatile memory). In Asus's iteration, however, you simply select which games and files you'd like to utilise the RAM cache. As soon as you log in, the RAM cache will efficiently cache the most mission-critical files. In testing, this decreases loading and transfer times by almost half, even on traditional SSDs, for files large or small.

HEY, GOOD LOOKIN'

How a motherboard looks also matters. And it's stunning. With a full rear I/O cover extending all the way down, covering the majority of the audio components; solid black MOFsets; and every PCIe, DRAM, and SATA port being either grey or black, it's hard not to choose the Asus if you're looking for a sleek black build. If it wasn't for the lack of armor, this board could be comparable to the Maximus VII Formula, a mobo we're still eagerly awaiting. And in today's age, it wouldn't be complete without some RGB lighting, huh? Well, Asus has you covered.

Ultimately, the Hero is utterly straightforward. It performs solidly, it looks incredible and is from a family of motherboards renowned for being high-end products. In the future, this will be a board we use as our dedicated test rig for all our graphics card and CPU comparison tests. And why not? It's gorgeous and fantastically well-rounded, with enough connectivity to keep us happy for at least the next year (which is a long time in the tech world).

In conclusion, if you're looking for a great all-rounder that's packed with features and is better-looking than Angelina Jolie, this could be the one for you. If we had to complain about anything, other than the lack of any extreme differentials in performance, it would be the inclusion of RGB LEDs on a board that's littered with flecks of red detailing. Otherwise, it performs admirably. **–ZAK STOREY**

VERDICT

9

KICK ASS!

Asus Maximus VIII Hero

⊞ **HERO** Best-looking board we've seen; RAM cache is brilliant; good connectivity; stunning UEFI; dedicated water-pump header.

⊟ **ZERO** The RGB LEDs don't make sense with the red decoration.

$229, newegg.com

BENCHMARKS

	Asus Maximus VIII Hero	MSI Z170 Gaming M7
Cinebench R15 (index)	911	**915**
x264 video encoding (fps)	57	**58**
Memory bandwidth (GB/s)	**29**	26
Shadow of Mordor (min/avg fps)	61 / **93**	**62** / 91
Maximum overclock (GHz)	**4.8**	**4.8**

Best scores are bolded. All tests with Intel Core i7-6700K.

SPECIFICATIONS

Chipset	Intel Z170
Socket	LGA1151
Form factor	ATX
Storage	6x SATA, 1x M.2, 2x SATA Express
USB	4x USB 2.0, 2x USB 3.0, 1x USB 3.1 Type-A, 1x USB 3.1 Type-C
Multi-GPU	Crossfire, SLI

Razer Kraken Pro

All about the buttery biscuit bass

WHAT IS IT WITH RAZER and just not doing so great lately? If there was ever a time for it to shine, you'd think it would be now. After years of research and development, it should be winning hearts and minds with its LED-encompassing peripherals of power. However, that's simply not the case. That's not the way the cookie crumbles, and nowhere is this more apparent than with the Razer Kraken Pro.

Headsets have come a long way over the last decade. And even though this variant of Razer's prestigious Kraken series is priced competitively, at around $80, it just doesn't hold its own when compared to solutions from competitors such as QPad, Steelseries or Asus. It suffers from "gamer's syndrome." What do we mean by that? Simply put, too much bass.

For some reason, many peripheral manufacturers have a tendency to lean too heavily on the bass production side with their headsets. And although this is great if you're looking to have dubstep playing at max volume constantly, it just doesn't cut it if you're looking for high-quality audio fidelity. This may be news to Razer, but a well-rounded headset consists of mastering not only the lows, but also the mids and the highs. The treble and the mids are just as important as the bass.

Even in gaming, you need to hear the crunch of the explosions, the gun shots, the clash of swords, not just the dull thud of the bomb going off as it reverberates around your eardrums, slowly caressing them into oblivion. If you're looking to get these headphones for well-rounded sound reproduction, don't. Unless, of course, bass-heavy noise is your thing. In which case, these could be for you.

However, it's not all doom and gloom for poor old Razer. The headset is a lovely fit. There's just enough tension, meaning that even after long periods of listening to music or gaming, it's still exceedingly comfortable. The earcups are a little small, though they do entirely surround your ears (as long as they're fairly small). Razer also provides an extension cable to ensure you have enough room to maneuver.

COULD BE WORSE

The headset looks pretty stylish too. The white finish for this particular special edition makes it a solid-looking piece of kit. But unfortunately, you still wouldn't want to wear these things in public. Even with the retractable microphone, the garish Razer typeface littered across the top of the headband makes you feel like a bit of a donkey—not a design choice we're fans of here. The retractable mic is a fantastic addition, and has extensive noise-cancelling features, so much so that in some cases we couldn't get it to register sound at all. You might need to tweak it to actually get it to pick up your own voice, but all in all, it's quite the challenge just to register any noise on the poor thing, even in a busy office environment.

Ultimately, these headphones just don't provide a compelling offer to anyone who's looking at Razer for more than brand worship. They don't provide good sound reproduction, the microphone is flakey at best, and, if you have ears even slightly more than average-sized, you're going to struggle to fit them comfortably around your lugs. The extension-capable, retractable mic and four-pole adaptor for mobile usage are nice additions, but they're just not enough to redeem its prior sins. When there are better, cheaper alternatives out there, such as the Kingston HyperX Cloud Gaming or QPad's QH-85, we're genuinely confused as to what Razer is playing at here. –**ZAK STOREY**

VERDICT
5

Razer Kraken Pro

CRACKING Handy extension cable; four-pole adaptor; retractable mic.

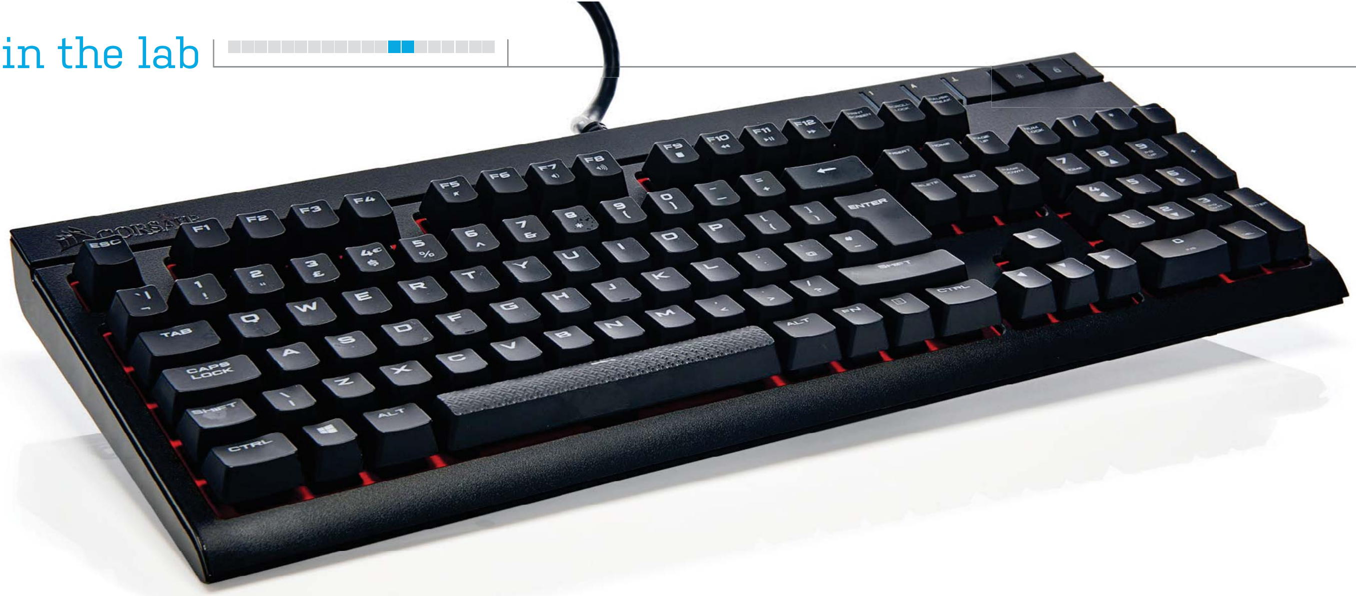
CRACKED Poor sound quality; no memory-foam padding; garish typeface design; flakey microphone.

$80, www.newegg.com

SPECIFICATIONS

Driver size	40mm
Frequency response	20-20,000KHz
Weight	300g
Cable length	1.3M (3.3M with splitter adaptor)
Connection type	3.5mm headphone/mic + four-pole adaptor for mobile
Mic	Unidirectional

That little white triangle on the right earcup is the mic.



Corsair Strafe Mechanical Keyboard

Clicky quality from sensitive switches

MECHANICAL KEYBOARDS. Love them or hate them, they're here to stay. Whether you're still not convinced it's worth dropping the extra $60 or $70 on a mechanical key switch or not, it might be worth giving this review a read.

Corsair brings to the overcrowded table a slimline version of its popular Vengeance series of boards. It's a brand synonymous with solid build quality and premium feature sets, and the Strafe doesn't disappoint. Packing Cherry MX Red key switches, it's quiet, but still has that mechanical sound and feel associated with Cherry's carefully crafted clackers.

If this is your first time delving into the world of Cherry switches, you'll find the Red switch is very soft to the touch. It has an incredibly sensitive actuation point, meaning that placing just a small amount of pressure down on the key will activate the switch, without any tactile feedback to let you know that you've activated the key. Sounds bad? Well, not entirely. Once you adjust to the new switch style, you'll find it's actually very responsive, meaning it's much easier to react to otherwise more difficult situations. It's ideal for gaming.

The overall build quality of the Strafe is impressive. Although it has a plastic outer shell, the keyboard itself has very little flex. This is primarily down to Corsair including an aluminum support bar through the middle of the board, not that you'll ever see it. And while it lacks the classy metal chassis of its older K70 Vengeance brothers, the Strafe is still a good-looking keyboard with a beautiful set of outlying LED stripes to complement the overall gaming feel. It also features the LED controller found in Corsair's latest RGB series of peripherals. That means you can have any number of complex LED wave patterns and responses to boot. It sounds like a gimmick, but trust us, you can spend hours just staring at your keyboard as it reciprocates like a Cylon or ripples from your touch.

BEYOND THE CYLONS

Other features include media control via the function keys, brightness control and a Windows lock key. The board also comes with a USB passthrough, which is handy. Depending on whether or not you're playing MOBAs, you can even change out the key caps and the more traditional WASD keys.

The only downside to this board is the lack of truly dedicated media keys. It would have been nice to see a dedicated volume wheel and other keys in the top-right. However, for the price point, it's understandable why Corsair couldn't include them. Other than that, a wrist rest would have been a bonus, too, as it can sit a little high on your desk. Again, this does take some time to get used to.

Granted, there are a few alternative mechanical keyboards out there for this price, but none of them feature the same integrated LED controller or the modern level of gaming aesthetic design as seen on the Strafe. That said, you can pick up a K70 Vengeance in red now for the same price—despite its slightly dated design, the dedicated media keys and all-aluminum body make it incredibly tempting (not to mention the lack of garish sails). Should you buy this? Well, if you like pretty lights and want a solid, dependable and versatile gaming keyboard, then yes, the Strafe is certainly worth considering. It could be your weapon of choice. **–ZAK STOREY**

VERDICT 8

Corsair Strafe Mechanical Keyboard

+ DOG FIGHTER Great build quality; good-looking design; LED controller; authentic Cherry switches; USB passthrough.

− CANNON FODDER Lack of dedicated media keys; still $110; lack of aluminum chassis; no wrist rest; difficult key caps.

$110, www.newegg.com

SPECIFICATIONS

Switch	Cherry MX Red / Brown
Connectivity	USB passthrough
Size	448 x 170 x 40mm (full keyboard layout)
LEDs	Individually lit (red)
Report rate	Selectable 8ms, 4ms, 2ms, 1ms and BIOS
Macro keys	All of them
Matrix	100% anti-ghosting, 104 key rollover

OCZ Trion 100

Getting a little TLC from Toshiba

IN THIS BRAVE NEW WORLD of PCI Express storage, M.2 drives, U.2 drives and fancy NVMe protocols, is there any space for ye olde 2.5-inch SATA drive and its piffling 6Gb/s of bandwidth and crusty AHCI interfaces?

That this is even in doubt says a lot about how fast storage technology for the PC has changed in recent years. An SSD hooked up via four lanes of PCI Express connectivity has the potential to be as much as five times faster than a SATA drive, in terms of raw throughput. What's more, that NVMe protocol promises much better random access performance.

On the other hand, even a mediocre SATA SSD will annihilate a conventional magnetic hard drive by pretty much any metric. But here's the real kicker. Unless your PC is super new, odds are it won't support M.2, SATA Express or any of that PCI Express newness. Of course, adaptor cards are available. But compatibility can be hit and miss. In other words, if you're looking for a painless option for upgrading your storage, SATA drives will remain relevant for some time to come.

Enter, therefore, OCZ's latest, the Trion 100. Tested here in 960GB spec, it's a big old beast for a solid-state drive in terms of capacity, but such is the plummeting price of flash memory these days, it can be had for around $300. In other words, we're fast approaching the time when you can have both speed and capacity in a vaguely affordable SSD.

How does OCZ do it? Well, regular readers will recall that Japanese megacorp Toshiba snapped up OCZ whole when the latter got into financial difficulties. This drive is therefore a baby of OCZ's marriage with Toshiba.

REAL-WORLD WORRIES

No surprise, then, that is uses Toshiba NAND memory. And not just any old NAND memory, but Toshiba's latest TLC, or triple-level cell memory. More data bits per cell means more data density and lower cost per gigabyte, of course. It also sports a Toshiba TC58 controller chipset, details on which are basically non-existent. But the take home here is that this drive's OCZ-ness probably doesn't extend much further than branding. OCZ is now Toshiba's brand for retail SSD.

So, how does it perform? Patchily, if the truth be told. The headline raw bandwidth numbers in the ATTO benchmark look pretty good. Like most SATA SSDs these days, it's basically bumping into the limitations of the storage interface. But as soon as you step outside of that best-case box, things can get a bit wobbly. In AS SSD's incompressible sequential tests, for instance, the results for the write test, in particular, were all over the place. We ran it around 15 times and the spread of results was over 200MB/s, with the top-scoring 436MB/s still not being that great and feeling like a one-off. Also up and down were 4K random writes.

Oddly, the Trion's performance in the PCMark consistency test was less volatile, albeit from a not hugely impressive baseline. But if we had to pick a killer blow, it would be the Trion's tardy performance in our 30GB file copy test. At nearly four and half minutes, it's getting on for half the speed of Samsung's 850 Pro 2TB model. Yes, that's a much more expensive drive. But it provides uncomfortable context for the Trion's real-world performance. –JEREMY LAIRD

VERDICT 6

OCZ Trion 100

+ GOOD LOVIN' Punchy pricing for such a big drive; reassuring 240TB endurance rating.

− NEEDS SOME LOVE Very patchy performance in testing—both synthetic and real-world; three-year warranty is a little on the stingy side.

$309, www.newegg.com

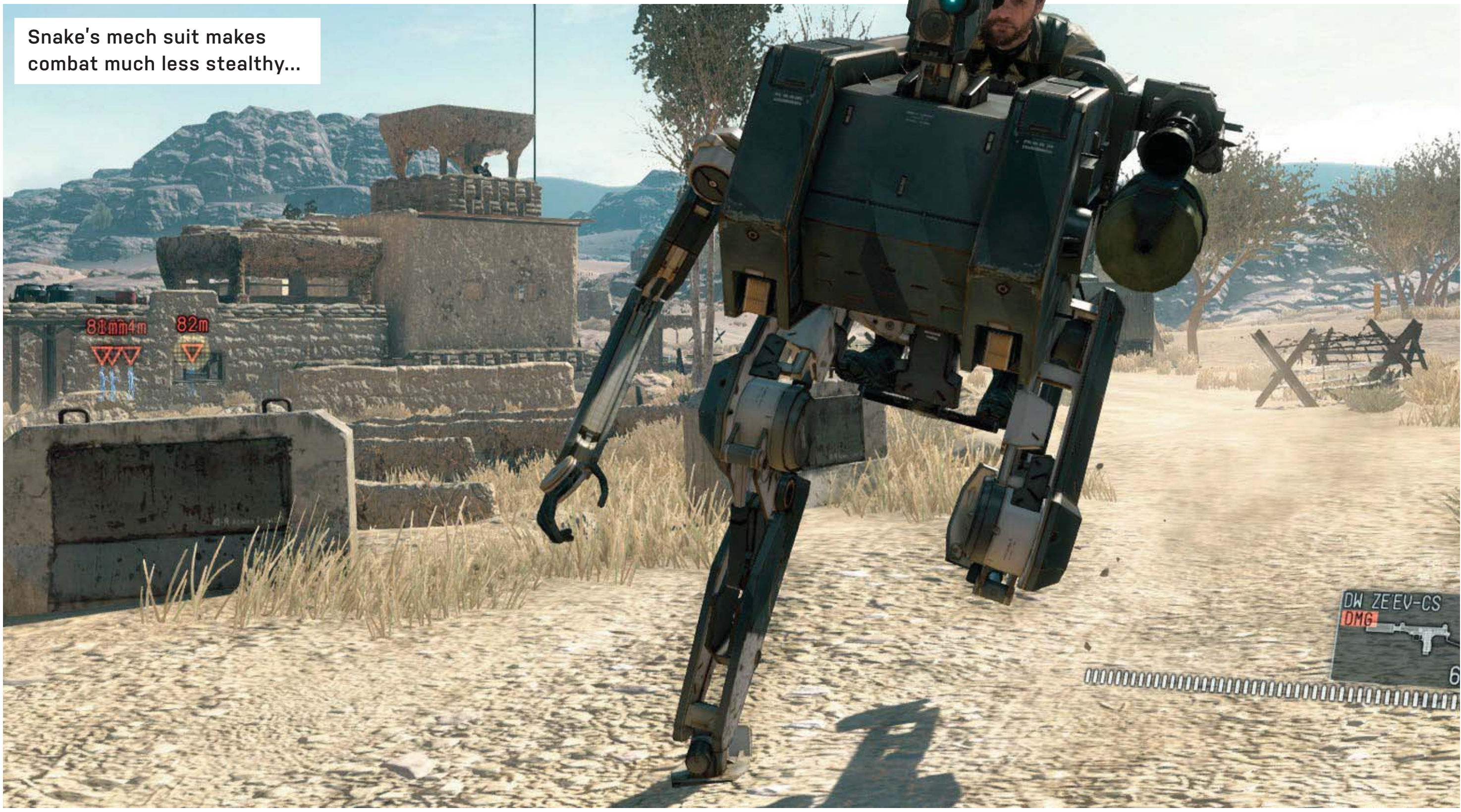
BENCHMARKS

	OCZ Trion 960GB	Samsung 850 Pro 2TB
AS SSD incompressible sequential read (GB/s)	**513**	**513**
AS SSD incompressible sequential write (GB/s)	436	**499**
AS SSD 4K random read (GB/s)	31	**41**
AS SSD 4K random write (GB/s)	92	**126**
ATTO sequential read (GB/s)	**564**	404
ATTO sequential write (GB/s)	**517**	427
5GB zip compression (secs)	**194**	**194**
30GB file copy (secs)	263	**160**

Best scores are bolded. Tested on Intel Z170 motherboard with Intel Core i7-6700K CPU.

SPECIFICATIONS

Interface	SATA 6Gb/s
Form factor	2.5-inch
Capacity	960GB
Controller	Toshiba TC58
Memory type	19nm TLC NAND
Max IOPS	90,000
Endurance	240TB
Warranty	Three years



Snake's mech suit makes combat much less stealthy...

Metal Gear Solid V: The Phantom Pain

A polished game like no other—save *The Witcher 3*

TWELVE YEARS ON, *The Phantom Pain* is series creator Hideo Kojima's latest (and final) attempt (passing over its excellent single-level demo/prequel, *Ground Zeroes*) to move *Metal Gear* to PC. This risks sounding hyperbolic, but we'd assumed that *The Witcher 3* was this year's gaming peak—*MGSV* might just prove us wrong. It serves the fans who've loved the series from its PlayStation days, while demonstrating an unprecedented level of awareness of other games and staying coherent. It's both an artifact of its vanished world and a huge, very modern device that pulls all the levers and ticks all the boxes.

For those who don't know the story of the franchise... don't bother. It's almost incomprehensible. This game, for example, is set smack right in the middle of the series' plot, in early '80s Afghanistan and Angola. You're playing Snake in this game, but not the Solid Snake of the first *Metal Gear Solid*, or the Liquid Snake he kills in *MGS3* or even Solidus Snake, the President of the U.S.A—but their clone-father Venom Snake, AKA Big Boss. The same Big Boss who apparently dies at the end of the later-set *MGS1*.

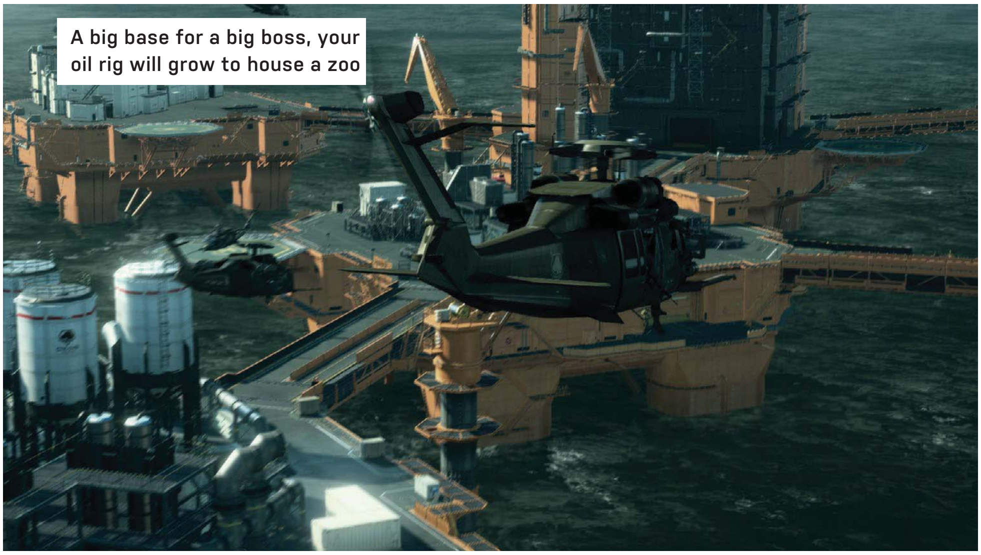
More important than any of that plot—which you won't understand without scouring wikis or Reddit, we promise—is that the very first upgrade you get for your helicopter are some speakers that allow you to blare out '80s pop music like A-Ha or David Bowie. But you need to find cassette tapes around the huge open world to play any music at all. Which becomes one of your primary motives to play the game.

Alongside that sense of surreal humour, the developer is also not afraid of being smart and dealing with war in a more adult way than its peers. Even the strange, brave opening has Snake waking from a nine-year coma to find his arm missing, his body withered, and his hospital under attack from soldiers, assassins and otherworldly beings, so he must learn to crawl and walk in record time. After that initial tutorial stage, the plot doesn't really re-appear for another 30 hours or so.

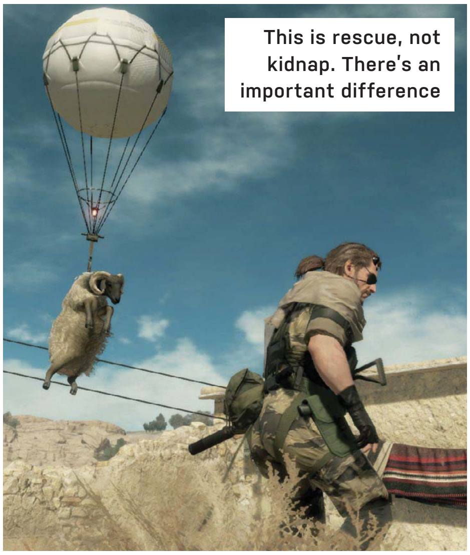
Yet, underlying all the silliness and moralizing are several strong gameplay systems that tie the game together. The open world stealth and combat are the most important. Essentially, you can get dropped anywhere in an area of the map and ride around it on your horse, either doing missions, exploring the terrain, spying out enemies using your binoculars, tracking objectives using something very much like an iPhone, and subduing or killing lots of people (and animals).

SNAKE IN THE GRASS

The game pushes you towards stealth and non-lethal behavior. Sneaking around causing chaos in an enemy base, unseen, is huge fun, tranquilizing enemies, destroying generators and taking out radar dishes and comms equipment. Should you get spotted, you have a couple of slow-mo seconds to take that enemy down before he calls for reinforcements. And even if you end up going into combat proper, it's a highly flexible game, letting you move fluidly between gung-ho firefights and sneaky silent takedowns. And your chopper—named Pequod, after Ahab's

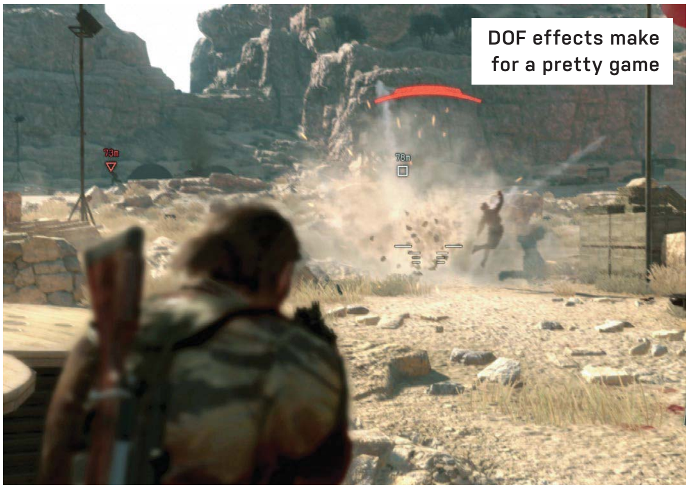


A big base for a big boss, your oil rig will grow to house a zoo



This is rescue, not kidnap. There's an important difference

The inevitable return of the cardboard box...



DOF effects make for a pretty game

ship—can be upgraded as well into a formidable combat machine.

The more you wander, the more missions you can find. Though the missions do have an official order, you can do them in any order you want. Side missions give you bonus money, staff and tech, whilst the main story missions gradually advance time. Oh, and let's not forget how amazing that open world is, shifting from deserts to mountains to savannah, and scattered with wildlife. As sandstorms sweep in, visibility drops which you can take advantage of; and it rains, your footprints are erased.

More importantly, the enemies in this open world seem to learn from their mistakes. If you headshot enemies at night regularly, then they learn to wear helmets and carry torches. Then you can go on missions to destroy their helmet supplies and attack by day. But they'll call in helicopters and reinforcements by day to sniff you out, so you destroy their radios and target mobile radio operators first. So they move in groups, to deter you. Given that you're endlessly upgrading your equipment too, it feels like a genuine arms race.

Just a little way into the game, you get access to Mother Base, Snake's mercenary headquarters. As you carry out missions for the highest bidder in Afghanistan, you acquire income and resources which you can use to upgrade this floating oil rig into something ridiculously enormous. You can also kidnap soldiers you subdue in the field, using the frankly insane Fulton parachute device, to send them back to the base for induction into your giant mercenary army. Every soldier has a different stats line for how well they'll work in Mother Base—the best ones also have special skills, which are necessary for certain types of research.

Learning from the invasion mechanic of *Dark Souls*, players can also build and customise Forward Operating Bases in the world, which provide additional resources and income. However, other players can attempt to raid them, to steal the resources, but doing so reveals your own FOBs to the enemy—so there's a neat revenge-driven PvP mode right there. A bigger multiplayer-only mode to the game, *Metal Gear Online*, is due to be released in January next year.

The Phantom Pain is a huge, twisty game, which will drain almost as much of your time as *The Witcher 3*. It's very much a collect 'em up, but also a sandbox, where you can take a hundred different routes, and do the objectives in any order you please—or not at all. It's a pity that the plot isn't better constructed, but we're very thankful that we didn't have to sit through another four-hour intro movie. **–DANIEL GRILIOPOULOS**

VERDICT

9

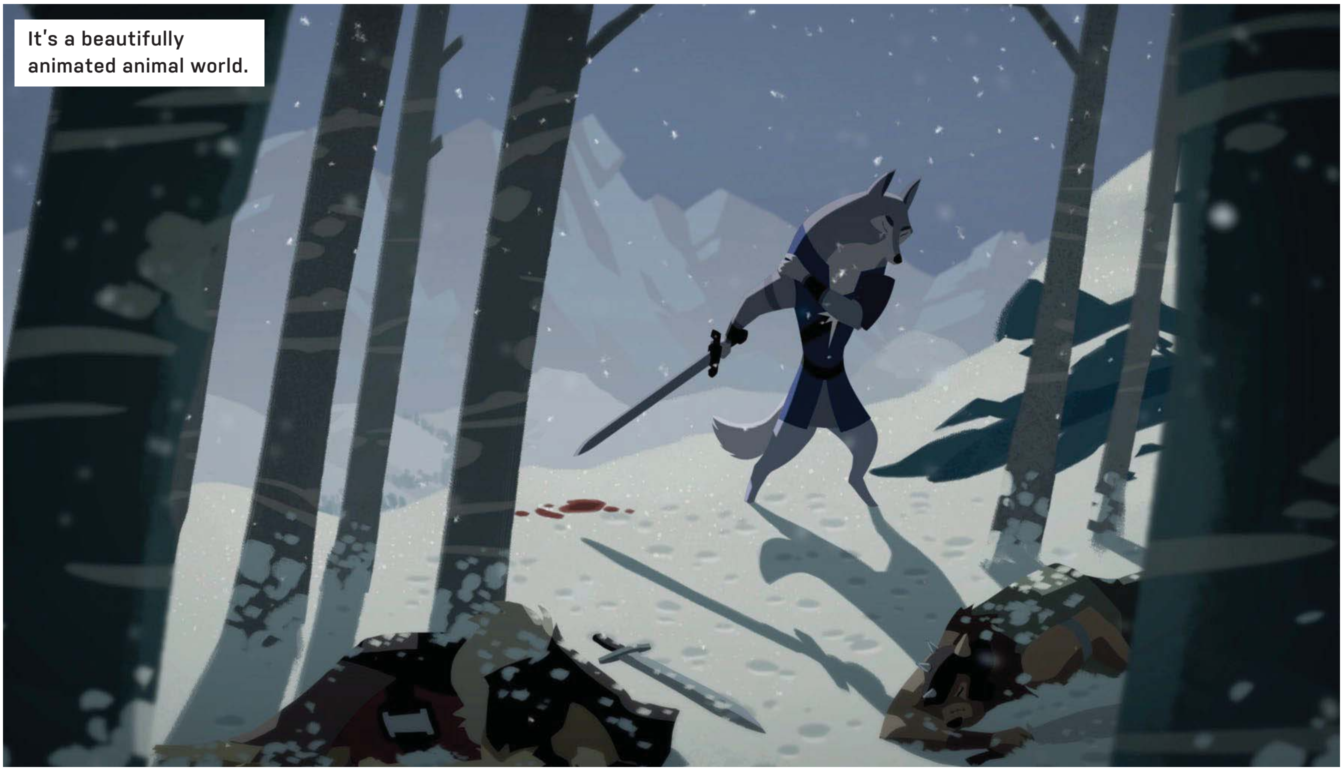
Metal Gear Solid V: The Phantom Pain

+ **GLORIOUS** Insanely rich open world to explore and conquer; amazing looking graphics; huge amount of content to unlock.

− **PLOTLESS** The plot vanishes.

RECOMMENDED SPECS i7-4790 (3.6GHz) or better, GeForce GTX 760 (DX 11 required), 8GB RAM.

$60, http://www.konami.jp/mgs5/, M-rated



It's a beautifully animated animal world.

Armello

A dark fantasy board game inspired by *Redwall*

IN THE KINGDOM of Armello, the mad lion is king. That might sound like bad poetry, but *Armello* is a strange game—hugely familiar, but also extremely unusual. It's a board game, definitely, but one that's been developed purely as a computer game, so it can do things board games never could.

You take control of one of four characters, leaders of factions in the peaceful kingdom of Armello. Well, it used to be peaceful. The king has been infected by a disease called the Rot. He's slowly dying and succumbing to madness at the same time, and—just like the Fisher King legends—the realm is also suffering, with dungeons opening up across the land, spitting out winged "banes" that terrorize the towns of the world. The King's Guard is struggling to contain them.

Your task is to save the kingdom—either by curing the king, or killing him, or being the most prestigious faction leader when he succumbs to the Rot. Oh, and all the characters are animals. Beautifully animated, wonderfully drawn cute animals. The king's a lion, the guards are dogs, and the banes are vultures.

You get to choose between a wolf, bear, rabbit, and rat. Each has a different play style and different levels of strength, body, wit, and magic, so they specialize in the various interactions around the world. The wolf is an out-and-out killer, hunting down other animals. The bear can kill the banes with ease, but is poor at other combat. The rabbit is best at exploring dungeons. And the rat is best at tricks and making money.

THE HEX FACTOR

The world is hex-based, built around the king's palace, and each character moves around it slowly, grabbing treasure, pursuing quests, defeating banes, exploring dungeons, capturing towns, and stumbling into perils. The depth of the world is comparable to *King of Dragon Pass* or *Pillars of Eternity*, a tightly described world shown off in delightfully animated card designs.

Each player has a hand of cards that gets refilled every turn. Each card can either be used as is, to give you treasure or to cast a spell or to summon a peril, or discarded to give you a bonus during combat or a peril. Certain actions or outcomes give your character the Rot, too, which slowly kills them. When a player dies, they return to their starting position and lose prestige.

All these systems gel really well together, leaving a tight virtual board game that feels like *Small World*, but is asymmetric, so players are each striving to win the game in a different way. After a couple of goes, you'll really understand how the game works; and have also unlocked some new items that modify how it plays, too.

It has to be admitted that, despite having this joyous world to play in, the single-player option does get a bit, well, samey. It's also very slow. The solution is to concentrate on playing multiplayer with friends (the game is sold as a four-pack for that reason), vary which character you play as, and make sure you grab the four new characters when they're released, which will add much more variety to the game.

Despite that, *Armello* is a smart, beautiful game that's small enough to understand easily, but complex enough that it's hard to master. Play it with your friends!

–DANIEL GRILIOPOULOS

VERDICT 7

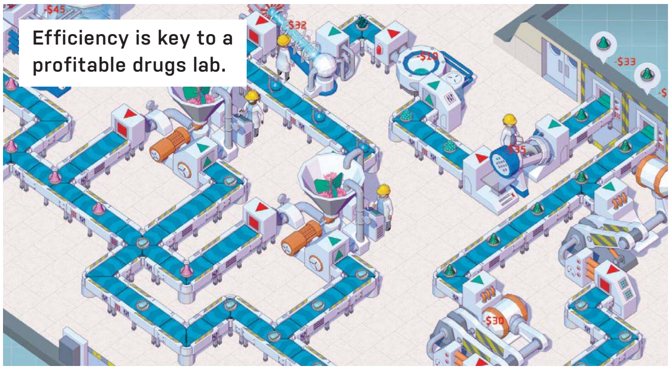
Armello

HOT SHOT Beautiful design; unusual board game systems; great multiplayer.

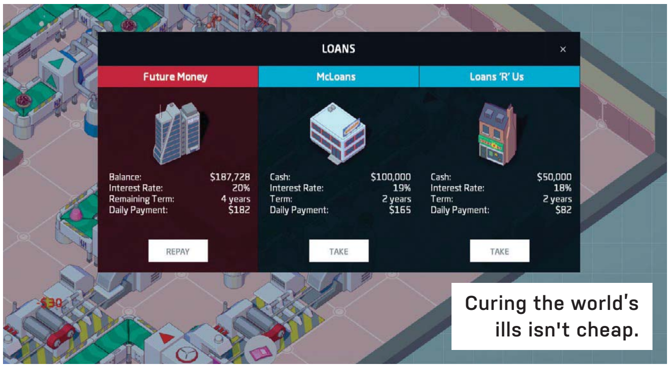
GOT THE ROT Single-player game can feel a bit limited.

RECOMMENDED SPECS Quad-core 2.5GHz CPU; DX11-class GPU; 4GB RAM.

$20, www.armello.com, PEGI: 7



Efficiency is key to a profitable drugs lab.



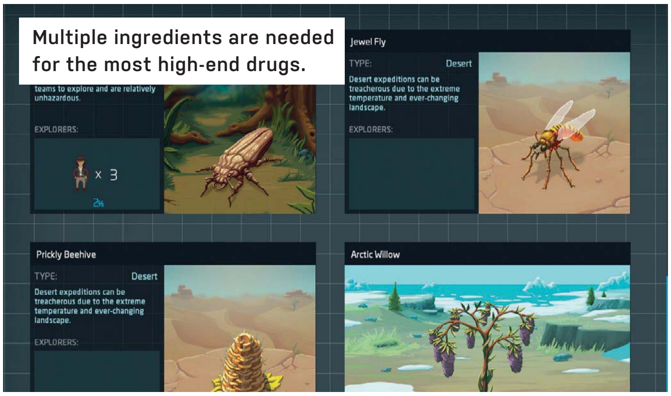
LOANS

Future Money
Balance: $187,728
Interest Rate: 20%
Remaining Term: 4 years
Daily Payment: $182
REPAY

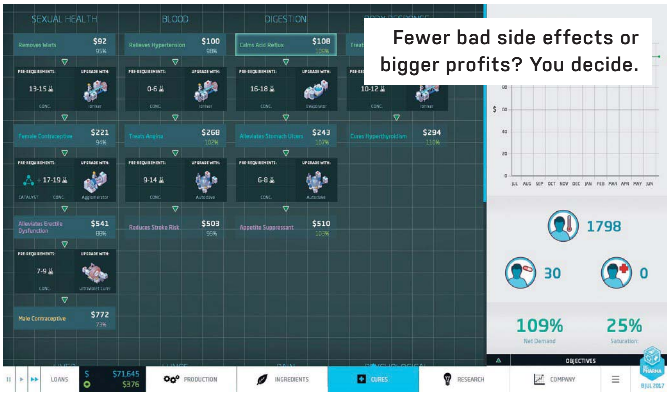
McLoans
Cash: $100,000
Interest Rate: 19%
Term: 2 years
Daily Payment: $165
TAKE

Loans 'R' Us
Cash: $50,000
Interest Rate: 18%
Term: 2 years
Daily Payment: $82
TAKE

Curing the world's ills isn't cheap.



Multiple ingredients are needed for the most high-end drugs.



Fewer bad side effects or bigger profits? You decide.

Big Pharma

The drugs don't work... but they sell like hotcakes

THEME HOSPITAL games have mostly avoided medicine. In fact, let's face it, games mostly avoid difficult themes—probably because titles like the superbly depressing environmental destruction simulator *Fate of the World* have a tendency to not sell well. And we suspect the *Democracy* series only sells because the results of political and economic decisions within it are so apocalyptic. *Big Pharma*'s tack is more on the manufacturing side, which makes it closer to logic games such as *SpaceChem*. Except its focus is the drugs industry.

Here, in *Big Pharma*, you're a manager of a pharmaceutical firm. You start with a handful of unlocked ingredients, a couple of simple processing machines, and a small amount of floorspace to work in. Then you get to work out what drugs you can make that will be profitable, that are competitive against other drugs, and not packed with tons of horrible side effects.

Making those decisions is hard and expensive. The cost of ingredients and machines is high relative to the profit you'll earn from them. Discovering new ingredients by exploring distant lands is expensive—both in the high up-front hiring costs and cheaper day-to-day expenses. Researching new machines to improve your processes is also expensive. Using the analysis machine to determine peak concentrations is expensive. And removing side effects can be terrifyingly expensive.

The core mechanic is a little tricky to get your head around. Each ingredient has positive aspects—like curing heartburn—and negative ones—like causing flatulence. Each positive aspect can be upgraded into a higher-value treatment by certain processes, and some negative aspects can be removed in the same way. Each aspect also has a concentration at which it is active, and another at which it's at maximum strength. The best drugs will have all their positive aspects maximized, all the side effects removed and be packaged in a nice profit-enhancing form.

MONEY OVER MORALITY

To make the perfect drug, you use your processing machines to raise and lower the concentration, connect them with belts to transfer the material, and encapsulate them as pills, creams and so on. Each factory area only has a certain number of inputs, so efficiency of design is vital.

Joyously, there are several sandbox modes that let you play the game in different ways, as a well as a custom game mode. For us, the best way to play it at the start was as a custom game without competing companies, as struggling against your budget to make an effective drug was difficult enough for a beginner.

Though it's very clean to look at, *Big Pharma* doesn't have the pure elegance of *Infinifactory* or *SpaceChem*, as its puzzles are as much about generating generic problem-solving revenue. Also, the necessity for plugging conveyer belts rather than connecting machines directly everywhere is slightly forced. Finally, it also, despite its theme, doesn't make any moral comment on the drugs industry, which is surprising.

Big Pharma is a smart game for players who love hard puzzles. The fact it's about drugs is by-the-by, but it's a clean-looking product that's mentally healing, without being too addictive. **–DANIEL GRILIOPOULOS**

VERDICT
7

Big Pharma

RED PILL Looks great; good puzzles; pleasingly difficult; tons of game mode options.

BLUE PILL Puzzles can feel forced; moral commentary strangely absent.

RECOMMENDED SPECS Quad-core 2GHz CPU; GeForce 700 series GPU; 8GB RAM.

$25, www.bigpharmagame.com, PEGI: NR

LAB NOTES

JARRED WALTON **SENIOR EDITOR**

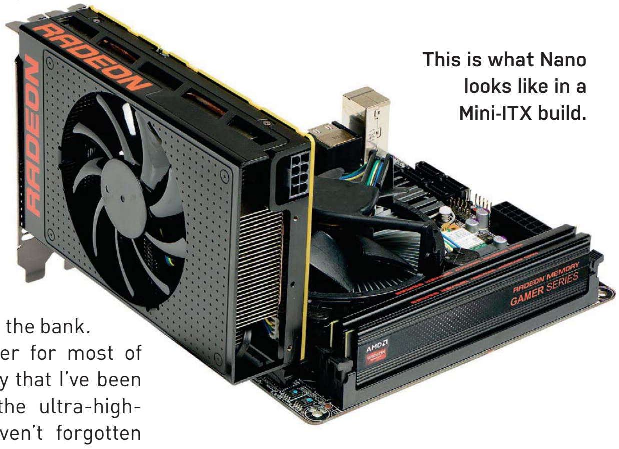
A Tale of Two GPUs

Which one reigns supreme?

AMD'S NEW NANO graphics card is sure to be a polarizing product. People who like the idea of a small but high-performance gaming system will love it, while users of full-size desktops may wonder what all the fuss is about. I'm generally a full-size desktop user, but I understand the benefits of such systems. They can be really awesome, and the Nano was reviewed as such. Just know in advance that Mini-ITX builds are more difficult to work with, given the confined spaces—meat sausage fingers need not apply! If you don't care about small systems, the Nano is just a really expensive GPU that's not as fast as the competition.

Now look at our other GPU review this month, the GTX 950. You could buy four of these for the price of one R9 Nano! (Not that you'd want to, since the GTX 950 only supports two-way SLI.) The Nano is about twice as fast, but for 1080p gaming, it's generally more than you need. That's what I love about the PC space. If price is no object, you can get some insane hardware, but if you're a budget-minded gamer, you can turn the settings down a notch and still get a great experience without breaking the bank.

I've been a budget gamer for most of my life, and it's only recently that I've been able to afford playing in the ultra-high-performance market. I haven't forgotten what it was like saving up my pennies to buy a 386 so I could run Wing Commander (with 2MB EMS memory via EMM386) when I was young. The things you can now do with a $600 budget gaming PC today are truly impressive, and the next generation of GPUs coming in 2016 will be even better. It's a great time to be an enthusiast! [Grumpy Old Man: "Kids these days don't know how good they have it!"]



This is what Nano looks like in a Mini-ITX build.

ALEX CAMPBELL

Associate Editor

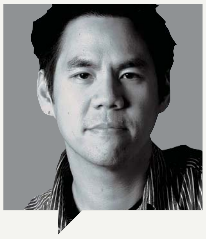
For a while now, I've been mulling over the YubiKey, and I'm probably going to get one to check out all its features and see how well it works in my everyday computing. There's something nice about the idea of using a USB device to generate second-factor inputs rather than waiting for an SMS.

One of the big challenges of data security is that it's often not convenient enough for users to employ best practices. Anything that makes it easier to sign and encrypt messages or that securely provides second-factor authentication is worth a try, in my book.

The only problem is that the YubiKeys are small, and I lose things all the time.

JIMMY THANG

Online Managing Editor



With new smartphones coming out every week, you'd think there would be at least one perfect one by now, but that couldn't be farther from the truth.

No matter who the manufacturer is, they'll often either have poor battery life, a mediocre camera, lack a microSD card slot for storage expansion, or just be too big to handle comfortably. The handset companies think they can cover up product deficiencies by slapping on a curved display or something, but I'm not falling for their gimmicks. If I want a big, small, or zany PC, I can tailor it perfectly to my exact needs. As hot as smartphones are right now, they still have a lot to learn from the PC.

First Look: DirectX 12 and the newest games

Ashes of the Singularity beats others to launch

OXIDE RECENTLY gave press pre-beta access to *Ashes of the Singularity*. If you've been hiding under a rock, this game is important as it's the first "real" DX12 benchmark—all other DX12 tests so far have been synthetic in nature. It's important to note that *Ashes* sports an AMD Gaming Evolved logo, so we expect it to perform better on AMD. This is nothing new; the same thing happens on the Nvidia side with "TWIMTBP" titles.

Under DX11 there were a lot of things that could be done in the GPU drivers to try to optimize performance. With DX12 being a low-level API, most driver optimizations go away; instead, it's up to the software developers to write optimized code to extract maximum performance from the GPU. If a developer has the resources, it could have different code paths for each DX12 GPU architecture from AMD, Intel, and Nvidia. That sounds like a lot of additional work, but that's the nature of low-level APIs.

Our take is simple: If DX12 performance doesn't equal or exceed DX11 performance, the developer needs to further optimize the DX12 code.

So, how does *Ashes* run in its pre-beta state? We tested AMD's R9 Fury X and Nvidia's GTX 980 Ti with various CPU configurations, and the results are interesting, to say the least. Nvidia's results are a mixed bag, while AMD sees huge gains relative to its DX11 performance… but its DX11 performance is abysmal. The 980 Ti is 50–75 percent faster than the R9 Fury in DX11; these are cards that typically show a 10–15 percent gap, and on an AMD title no less! Flip over to DX12 and things are more in line with what we'd expect, with AMD leading by 0–15 percent (depending on settings). So, the Fury X is currently slightly faster than the 980 Ti, but only in DX12 mode, and Nvidia's GPUs frequently show worse performance under DX12 than DX11. Oops!

As the first of many DX12-enabled titles slated for release between now and 2017, Ashes is at best a taste of what's to come. One thing is certain: DX12 doesn't mean the end of the GPU vendor wars; instead, the API looks to make the rivalry even more brutal. The GPU companies will need to provide developers with additional manpower to optimize games, so we'll potentially see more titles optimized to favor one over another. There's talk of AMD's GPUs being a better fit for DX12, with superior asynchronous compute capabilities, based on *Ashes* performance. That may be true, but we still maintain that DX12 should be able to match or exceed DX11 performance.

As it stands, *Ashes* shows us that DX12 definitely makes a difference, giving the game developers a lot more power. But with great power comes great responsibility, and some developers may not be able to handle DX12, or simply give it a pass. Look at games like *StarCraft II*, *Fallout 3*, and the *Mass Effect* series: there's nary a DX11 piece of code in sight, and DX11 launched in 2009. Clearly, DX11 isn't going away yet, but we'll continue to monitor the DX12 situation. And Oxide is only one developer. Unreal Engine, Unity, Frostbite, and other engines will likely show different results. **–JW**

Ashes to ashes, dust to dust.

GEEK TESTED & APPROVED

Crazy Foam
Crazy Foam
THE INTERNET
All the piracy,
none of the scurvy...

Crazy Foam

IT TOOK US A LONG TIME to test out this bodywash foam, even though it's been sitting on a desk, staring us in the face for months. Batman and Superman mocked us with their open mouths. Quit staring at me, Superman, when did you get shipped here, anyway? Bruce, what the hell are you even doing? We figured it was time we tried out this silly product.

As it turns out, Crazy Foam is about the same consistency of a thick shaving cream. Think Barbasol, but with more structural stability. We wouldn't advise using it as a shaving cream unless you've always wanted the nickname "Bazooka Joe." The foam smells strongly of bubble gum.

There is something fun about watching your favorite DC Comics hero puke out thick blue foam that produces olfactory memories of the week or so after Halloween, when all the chocolate candies are gone and you're just stuck with gum or that nasty candy corn.

While great for bringing back the nostalgia of a sucrose-crazed childhood that would seem nightmarish by today's organic, everything-gives-you-cancer parental mindset, this probably isn't a body wash you'll want to use every day. Unless you're five. Or you have a miniature human with a strikingly close genetic makeup to yours at home. Then it's A-OK. **–AC**

$6, www.crazyfoam.com

LETTERS

WE TACKLE TOUGH READER QUESTIONS ON...

> Practical GPU Upgrades
> Where's the Skylake?
> Hybrid vs Pure SSDs

New GPU for Old CPU

I currently have two AMD Radeon HD 4870s running in Crossfire mode. Since AMD will not release drivers for it for Windows 10, I would like to upgrade them to an Nvidia card. I game at 1920x1200 and I just need a single card that will be an upgrade to my current configuration for as cheap as possible. Would a GTX 950 or 960 give me better performance? I'm a little out of the loop when it comes to GPUs. My CPU is a G3258. **—Joey McCaleb**

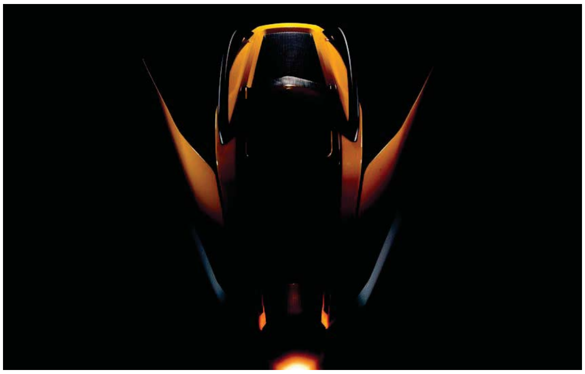
SENIOR EDITOR JARRED WALTON RESPONDS: True story: I took an HD 4870X2 to the local computer recycling place about two weeks ago, as I no longer had any use for it—the power requirements, noise, and lack of DX11 (and now, DX12) support basically made it worthless to me. They're listed at $85 on eBay, but who's buying?

GPU performance has improved by roughly 4x from the HD 4870 to the R9 Fury X. And you might be surprised to find out that, even at 4.7GHz, the G3258 is often quite a bit slower than even an Intel Core i3-4330 for gaming purposes. It turns out that the combination of more cache and Hyper-Threading actually does make a difference (with the cache being the primary benefit). You'll typically lose 10–20 percent of maximum GPU performance by running with the G3258, so there's no need to go with a super high-end GPU. GTX 950/960 is a good match; anything more than that and a CPU upgrade would be advisable, even if it's "only" to a Core i5-4690K. Of the two GPUs, right now, GTX 950 is new and tends to be priced a bit higher than it warrants, so the GTX 960 at $180 gets our recommendation over the GTX 950 at $160. AMD's R7 370 and R9 380 are also worth considering, but for power and performance considerations the Nvidia GPUs have the advantage.

[NOW ONLINE]

DREAM MACHINE 2020 PREDICTIONS

Every few years, we'll make predictions on how we think future Dream Machines will turn out. Historically, we've gotten some things right, but also a ton wrong (see: http://bit.ly/MPC_2015predictions). In another attempt to potentially make ourselves look foolish, we've taken a stab at how we think a future Dream Machine will turn out—specifically, Dream Machine 2020. Join us online as we predict what the most beastly personal computer will look like in five years. http://bit.ly/MPC_DM2020



Could Bumblebee's head be the case of your dream rig?

Time for an Upgrade

I just received the October issue and not a word of the new Skylake processors and Z170 boards. Any plans on doing some reviews? I've been holding out for a while for my next major upgrade and I'm excited to see how everything pans out in your labs. **—David**

SENIOR EDITOR JARRED WALTON RESPONDS: The nature of print means that the October magazine was finished before Skylake was out. By now, you've hopefully got the November issue, which features an in-depth report on Skylake (page 42), plus a review of the i5-6600K and i7-6700K Skylake chips (page 76), and a couple of Z170 mobos (page 82). Reviews have also been posted online (http://bit.ly/MPC_skylake), as has a comparison with an old overclocked i7-965 (http://bit.ly/MPC_SLBF) running

↘ submit your questions to: comments@maximumpc.com on X58. I also recently attended IDF 2015, where Intel provided additional information about the Skylake architecture (http://bit.ly/MPC_IDF).

Long story short, Skylake is going to be the go-to platform for the next year or two from Intel, and we'll probably see a Kaby Lake update next year that will be sort of like Devil's Canyon to Haswell (higher clocks, same core architecture, maybe some microcode tweaks). If you're running a recent Haswell or later platform, there's not a huge incentive to upgrade, but for older systems, you can definitely benefit.

Assuming your i7-920 is running overclocked, my only advice is that you look to upgrade to the i7-6700K, as the i5-6600K may not be as big of a step forward. The other upgrades, like the improved DMI link between the CPU and PCH, are definitely nice, but most consumers won't see a massive benefit unless they want to spend for things like an NVMe M.2 SSD.

As for motherboards, there were some early teething problems with some of the Z170 boards, but most of those have been worked out now. I've used Asus, Gigabyte, and MSI boards and have no real complaints with any of them. Unfortunately, it's still very difficult (and expensive) to get Skylake CPUs other than i5-6600K, so you might want to wait another month or two and let things settle down before taking the plunge.

Storage Squeeze

I use Adobe Lightroom (5.7) and Photoshop (CS6) a great deal. A couple of years ago, I purchased an Asus laptop with an i7-4700HQ, twin 1TB Seagate hybrid drives in RAID 0, 32GB RAM, GTX 765M, etc… I have always found the speed of opening files to be less good than I expected from a RAID 0 array of two hybrid (1TB HD plus 8GB SSD plus 64MB RAM) drives. I'm getting ready for my next system as I am running out of storage space and would also like more speed. The files I work with are mainly digital photographs, which are 20–40MB each.

So, a few questions: What CPU and GPU do I need? I'm guessing not too high a spec. Finally, the big question: What storage drives? I'm thinking two or more large SSDs in a RAID 0 array would probably fit the bill, but how much improvement could I get from M.2 or mSATA drives for my needs?
—John Taylor

SENIOR EDITOR JARRED WALTON RESPONDS: Hybrid drives are frequently over-hyped and rarely offer the performance benefits of a true SSD. The issue is that they're effectively trying to cache the most important data, but with only an 8GB SSD cache, there's not enough room to store all the important stuff. Windows itself can easily fill more than the 8GB cache, and if the hybrid drive has to go to the actual hard drive platters for data, it's going to result in performance equivalent to a pure HDD storage solution. RAID doesn't really help much either, since it only improves peak throughput but not access times, and on HDDs it's the access times that are truly painful (12–20ms is common, where pure SSDs are about 1,000 times faster).

I've found Photoshop likes a decent CPU and can benefit from a discrete GPU, but anything more than mainstream offerings (e.g., GTX 750 Ti or R7 370) won't really improve performance. Lightroom isn't something I use, but Puget Systems did a great guide looking at multi-core scaling with Lightroom (http://bit.ly/MPC_LRPuget); the benefit of going beyond quad-core i7 is pretty limited. Storage performance can still be a factor, and for the OS/apps drive I avoid HDDs like the plague; a good 2.5-inch SSD can be had relatively cheap these days ($173 for 500GB 850 EVO gets my vote).

The best PCIe NVMe drives (Samsung SM951 NVMe and Intel SSD 750) show some amazing performance results, but I'd personally save the money by going with SATA for now. For real-world use, any decent SSD is typically going to be 100x the random I/O performance of an HDD.

Try putting a pure SSD into your current laptop and see if it makes a difference. You might find all the other upgrades are unnecessary once you get faster storage. Of course, if you're low on storage capacity, you'd need to either spring for expensive 2TB SSDs (2TB 850 EVOs are $748), or move nonessential files to external storage.

I've found 500GB of SSD capacity is sufficient for all my daily needs, but if you absolutely have to have more than 2TB of data available and the hybrid HDDs are too slow, your best bet is to pony up for one or two large SATA SSDs.

Facebook Polls

The best free games?

Sure, we all love getting something for nothing. But are free-to-play games actually good? We asked our Facebook buddies.

Omar Diaz: MOBAs like *League of Legends*, *Dota 2*, and *Heroes of the Storm* are great and free to play. MMOs like *Star Wars: The Old Republic*, *Rift*, and many others are good at first but turn into a pay to win experience.

Clay Beall: *World of Warships* is by far the most fun F2P game out right now.

Hugh Lee: Shout-out to *Hawken*.

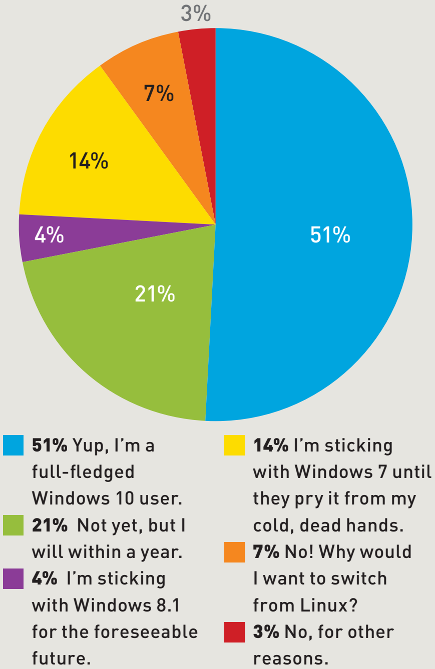
Paul Olinger Jr: *Star Control 2: The Ur-Quan Masters*. Oldie but goodie. Much of *Mass Effect* was inspired from elements in this game. A lot of the dialog is hilarious as well.

Joseph Bokano: *No More Room in Hell*. It's a staple at every LAN I set up.

Jason Ellison: *Path of Exile* is how a F2P game should be done. With purchases pertaining to cosmetics and stash size, it is easily the best out there with a perfect balance and no pay to win.

Daniel J. Hill: I've never played F2P games because they all seem kiddish and I'd rather be engaged with good story telling and/or beautiful graphics. Yes, I judge games by the cover and recommended specs, which probably makes me elitist.

Will you be upgrading to Windows 10?



🟦 **51%** Yup, I'm a full-fledged Windows 10 user.

🟩 **21%** Not yet, but I will within a year.

🟪 **4%** I'm sticking with Windows 8.1 for the foreseeable future.

🟨 **14%** I'm sticking with Windows 7 until they pry it from my cold, dead hands.

🟧 **7%** No! Why would I want to switch from Linux?

🟥 **3%** No, for other reasons.

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THE BUILDS

BUDGET GAMER

INGREDIENTS

PART			PRICE
Case	Cooler Master Elite 110	**NEW**	$40
PSU	EVGA GS 550W 80 Plus Gold	**NEW**	$77
Mobo	ASRock H97M-ITX/ac		$96
CPU	Intel Core i5-4590	**NEW**	$190
GPU	EVGA 3962-KR GeForce GTX 960 SC		$230
RAM	Crucial Ballistix Sport 8GB DDR3 1600	**NEW**	$45
SSD	120GB Sandisk Ultra I	**NEW**	$85
HDD	Seagate Barracuda 1TB		$65
OS	Ubuntu Desktop Linux 14.04 LTS 64-bit		$16

Approximate Price: $844

PRICES FOR COMPONENTS have risen for nearly everything we used in our last build, so we had to really shop to save some cash. Still, we found that we could create a very nice build that stayed under $850.

The first thing that had to go was the case. We went with the Cooler Master Elite 110, which is a nice little mini-ITX cube that's well priced at $40. We paired it with a slightly bigger PSU, which cost us. However, there's something to be said for EVGA's five-year warranty.

We also invested in the CPU, bumping up to a Core i5-4590. This cost us an extra $10, but we think that it is a worthwhile upgrade, and going the locked route saves some cash on both the CPU and mobo.

Finally, we switched up the RAM for Crucial's Ballistix Sport line. We found that RAM prices had risen, and the Ballistix Sport kit was one of the cheapest in the bunch. We also had to halve our SSD capacity to keep the build under budget.

MIDRANGE

INGREDIENTS

PART			PRICE
Case	Corsair Carbide 500R	**NEW**	$110
PSU	EVGA SuperNOVA G2 850W		$131
Mobo	Gigabyte Z170X-Gaming 3	**NEW**	$150
CPU	Intel Core i5-6600K	**NEW**	$250
Cooler	Corsair H100i		$112
GPU	XFX Radeon R9 390		$320
RAM	G.Skill Ripjaws V Series 8GB DDR4 2133 (red)	**NEW**	$58
SSD	250GB Samsung 850 EVO		$98
HDD	Western Digital Black Series 2TB		$119
OS	Windows 8.1 64-bit OEM		$100

Approximate Price: $1,448

THE TIME HAS COME to switch over to Skylake, and this build dives in head first. We replaced the trusty old i5-4690K with Intel's new i5-6600K Skylake CPU—a next-gen CPU that is well worth the extra.

With the Skylake upgrade comes a Z170 board with its LGA1151 socket. Luckily, Gigabyte had one available for the same price ($150) we paid for the MSI Z97 Gaming 5 that held the 4690K. The Gigabyte mobo has plenty of features, including two M.2 slots.

The Z170 board demands DDR4, and this meant we had to spend a little more on RAM. We went with the G.Skill sticks because of their price, and the red color goes with the red trim on the Gigabyte board.

Attentive readers will notice that we dropped our optical drive from our spec, and we also felt it was time to update our case, so we went with Corsair's 500R, which is $30 cheaper than the Vengeance C70, and is one of the reasons we felt we could afford Skylake in this build.

TURBO

AFTER LAST MONTH'S BUILD, we got over the idea of using Asus' hefty Rampage V Extreme. We opted for the $480 board's little brother, the X99-A. The X99-A is still a great board, and still has a whopping eight slots for memory. However, we had other priorities in mind: we really wanted to pair up some GTX 980Tis.

To go SLI within our (still large) budget, we had to pull back on other specs. We dropped from 32GB to 16GB of memory. While halving memory sounds brutal, we've still got 16GB. Most games and applications can't even use a full eight.

Another place we found savings was in storage. We got rid of the second 850 EVO and dropped the capacity of the WD Black to 2TB. Letting the second drive go didn't exactly break our hearts, as 500GB is still a lot of storage for an SSD. One could make an argument that we lose the ability to use RAID 0 by going with only one SSD, but the 850 EVO is still plenty fast. If you really feel the need for speed, just pick up a pair of 250GB units instead.

For the spinning drive, we felt that 2TB is still plenty. In an age of NAS drives and media streaming, not as many people keep big libraries on their PCs. People who do a lot of photo and video editing will want more drive space, but hard drives are still pretty cheap, and are only getting cheaper. If you'll need more space down the road, wait until you get there and you'll probably save some money.

For more of our component recommendations, visit www.maximumpc.com/best-of-the-best

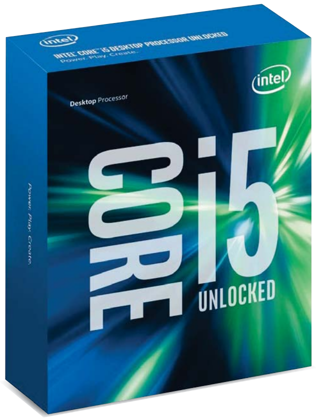
INGREDIENTS

PART			PRICE
Case	Corsair Graphite 780T		$190
PSU	EVGA SuperNOVA G2 850W		$131
Mobo	Asus X99-A/USB 3.1	**NEW**	$259
CPU	Intel Core i7-5820K		$390
Cooler	NZXT Kraken X61		$128
GPU	2x PNY GTX 980Ti 6GB	**NEW**	$1,300
RAM	16GB (4x4GB) G.Skill Ripjaws 4 Series DDR4 2133	**NEW**	$110
SSD	500GB Samsung 850 EVO	**NEW**	$176
HDD	2TB WD Black	**NEW**	$83
OS	Windows 8.1 64-bit OEM		$100

Approximate Price: $2,867

UPGRADE OF THE MONTH

INTEL CORE i5-6600K SKYLAKE



There's one upgrade we've been talking about for some time now: Skylake. In our tests, Intel's sixth-generation CPU offered a 20 percent improvement in performance from overclocking. At the time of writing, the Core i7-6700K wasn't available at retail, but the Core i5-6600K was. If you're looking to build a new Core i5 system that's ripe for overclocking, the 6600K is a good choice.

$250, intel.com

MAXIMUM PC (ISSN 1522-4279) is published 13 times a year, monthly plus Holiday issue following December issue, by Future US, Inc., 4000 Shoreline Court, Suite 400, South San Francisco, CA 94080. Phone: (650) 872-1642. Fax: (650) 872-2207. Website: www.futureus.com. Periodicals postage paid in San Bruno, CA and at additional mailing offices. Newsstand distribution is handled by Curtis Circulation Company. Basic subscription rates: one year (12 issues) US: $19.95; Canada: US$24.95; Foreign: US$34.95. Canadian and foreign orders must be prepaid. Canadian price includes postage and GST (GST #R128220688). PMA #40612608. Subscriptions do not include newsstand specials. POSTMASTER: Send changes of address to Maximum PC, PO Box 5852, Harlan, IA 51593-1352. Standard Mail enclosure in the following editions: None. Ride-Along enclosure in the following editions: None. Returns: IMEX Global Solutions, PO Box 25542, London, ON N6C 6B2, Canada. Future US, Inc. also publishes @Gamer, Mac|Life, The Official Xbox Magazine, and PC Gamer. Entire contents copyright 2015, Future US, Inc. All rights reserved. Reproduction in whole or in part is prohibited. Future US, Inc. is not affiliated with the companies or products covered in Maximum PC. Reproduction on the Internet of the articles and pictures in this magazine is illegal without the prior written consent of Maximum PC. Products named in the pages of Maximum PC are trademarks of their respective companies. PRODUCED IN THE UNITED STATES OF AMERICA.

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